

# كلية الطف الجامعة

## قسم تقنيات هندسة الحاسوب

### نظرة عامة على القسم

يُعنى قسم هندسة تقنيات الحاسوب بإعداد كوادر هندسية تطبيقية متخصصة في تصميم وتطوير وتشغيل الأنظمة الحاسوبية بمختلف مكوناتها المادية والبرمجية. ويجمع القسم بين علوم الحاسوب والهندسة الإلكترونية وتقنيات الاتصالات والأنظمة الذكية، ليمنح الطلبة أساساً علمياً رصيناً مدعوماً بمهارات عملية متقدمة، بما يواكب التطورات المتسارعة في تكنولوجيا المعلومات والتحول الرقمي.

، ويؤهل (Software) والبرمجيات (Hardware) يركز القسم على التكامل بين العتاد الطلبة للتعامل مع الأنظمة المدمجة، الشبكات، أمن المعلومات، الذكاء الاصطناعي، وإنترنت الأشياء، بما يلبي احتياجات سوق العمل المحلي والإقليمي.

### الرؤية (Vision)

الريادة والتميز في مجال هندسة تقنيات الحاسوب من خلال تقديم برامج تعليمية عالية الجودة تُسهم في إعداد مهندسين تقنيين مبدعين وقادرين على تطوير حلول حاسوبية متكاملة تلبي متطلبات التنمية المستدامة والتحول الرقمي.

### الرسالة (Mission)

إعداد خريج مؤهل علمياً وعملياً في مجال هندسة تقنيات الحاسوب، يمتلك القدرة على تصميم وتطوير وصيانة الأنظمة الحاسوبية والأنظمة الذكية، مع تعزيز مهارات البحث العلمي والابتكار والعمل بروح الفريق، والالتزام بأخلاقيات المهنة والمعايير الأكاديمية العالمية.

## الأهداف (Objectives)

يسعى القسم إلى تحقيق الأهداف الآتية:

- تزويد الطلبة بأساس علمي رصين في هندسة الحاسوب يشمل تصميم الأنظمة الرقمية، المعالجات الدقيقة، وهندسة البرمجيات.
- تمكين الطلبة من تصميم وتطوير الأنظمة الحاسوبية المتكاملة التي تجمع بين العتاد والبرمجيات.
- إكساب الطلبة مهارات برمجة متقدمة باستخدام لغات وتقنيات حديثة لتطوير التطبيقات والأنظمة الذكية.
- تأهيل الطلبة للتعامل مع الأنظمة المدمجة (Embedded Systems) وإنترنت الأشياء (IoT) وتطبيقاتها المختلفة.
- تعزيز مفاهيم أمن المعلومات وحماية الأنظمة الحاسوبية من التهديدات السيبرانية.
- تطوير مهارات البحث العلمي والتحليل وحل المشكلات الهندسية بأساليب مبتكرة.
- إعداد خريجين قادرين على مواكبة التطورات التقنية من خلال التعلم المستمر والتطوير الذاتي.

## المميزات الرئيسية للقسم

- تخصص شامل ومواكب للتطور: يغطي مختلف مجالات هندسة تقنيات الحاسوب من الأنظمة الرقمية إلى الذكاء الاصطناعي.
- تركيز قوي على التطبيق العملي: مختبرات متخصصة تدعم الجانب العملي في مجالات البرمجة، الأنظمة الرقمية، المعالجات الدقيقة، الشبكات، والأنظمة الذكية.
- اعتماد نظام تعليمي حديث: تطبيق نظام بولونيا بما ينسجم مع المعايير الأكاديمية العالمية ويعزز جودة المخرجات التعليمية.
- كادر تدريسي كفوء: يضم القسم نخبة من التدريسيين ذوي الخبرة الأكاديمية والعملية في تخصصات هندسة الحاسوب المختلفة.
- مخرجات تعليمية متميزة: تخريج دفعات مؤهلة للعمل في القطاعين العام والخاص، مع إمكانية متابعة الدراسات العليا داخل العراق وخارجه.
- فرص عمل واسعة: تأهيل الخريجين للعمل في مجالات تطوير البرمجيات، تصميم الأنظمة الحاسوبية، الأمن السيبراني، الذكاء الاصطناعي، الأنظمة المدمجة، وإدارة مشاريع تقنية المعلومات.

## نموذج وصف البرنامج الأكاديمي

الكلية / المعهد: كلية الطف الجامعة

القسم العلمي: قسم هندسة تقنيات الحاسوب

اسم البرنامج الأكاديمي أو المهني: بكالوريوس هندسة تقنيات الحاسوب

اسم الشهادة النهائية: بكالوريوس في هندسة تقنيات الحاسوب

النظام الدراسي: سنوي / بولونيا

تاريخ اعداد الوصف: 15. 9. 2025

تاريخ ملء الملف: 16. 9. 2025



التوقيع:

اسم المعاون العلمي: م. د. رواد موسى حسين

التاريخ: 20 19 2025



التوقيع:

اسم رئيس القسم: أ. م. د. قاسم عبود مهدي

التاريخ: 17 19 2025



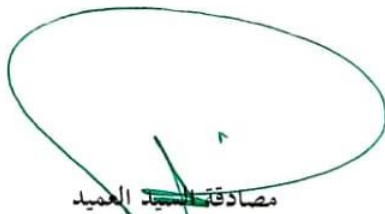
دقق الملف من قبل

شعبة ضمان الجودة والأداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي: م. د. احمد مظهر

التاريخ: 21 19 2025

التوقيع:



مصادقة السيد العميد

أ. د. كريم مزعل شبي

24. 9. 2025

## Academic Program Description Form

**College / Institute:**

Al-Taff University College

**Scientific Department:**

Department of Computer Engineering Techniques

**Name of the Academic or Professional Program:**

Bachelor of Computer Engineering Techniques

**Name of the Final Degree:**

Bachelor's Degree in Computer Engineering Techniques

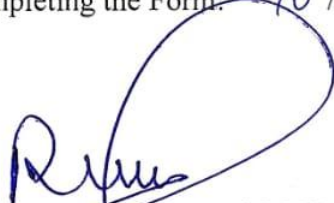
**Study System:**

Annual / Bologna System

Date of Preparing the Description: 15/9/2025

Date of Completing the Form: 16/9/2025

Signature:

  
**Scientific Assistant:** Dr. Rawad M. Hussain

Date: 20.9.2025

Signature:

  
**Department Head:** Dr. Qasim A. Mahdi

Date: 17.9.2025

**File Reviewed By:**

Quality Assurance and University Performance Division

Name of the Director of the Quality Assurance and University Performance Division:

Dr. Ahmed Mudher

Date: 21/9/2025

Signature:

  
Approval of the Dean  
Prof. Dr. Kareem M. Shabby

24.9.2025

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                     |                               |                                                      |
|------------------------------------|-------------------------------------|-------------------------------|------------------------------------------------------|
| معلومات المادة الدراسية            |                                     |                               |                                                      |
| Module Title                       | Digital Fundamentals                |                               | Module Delivery                                      |
| Module Type                        | Core                                |                               | ✓ Theory Lecture<br>✓ Lab Tutorial Practical Seminar |
| Module Code                        | CET1101                             |                               |                                                      |
| ECTS Credits                       | 6                                   |                               |                                                      |
| SWL (hr/sem)                       | 150                                 |                               |                                                      |
| Module Level                       | 1                                   | Semester of Delivery          | 1                                                    |
| Administering Department           | CET                                 | College                       | EETC                                                 |
| Module Leader                      | Dawood Sallem Hussian               |                               | e-mail<br>dawood.hussian@altuff.edu.ig               |
| Module Leader's Acad. Title        | lecturer                            | Module Leader's Qualification | Msc.                                                 |
| Module Tutor                       |                                     | e-mail                        |                                                      |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah Taher Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                |
| Scientific Committee Approval Date | 29/10/2023                          | Version Number                | 1.0                                                  |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>1. To be able to deal with the number systems and codes.</li> <li>2. To understand the functionality of logic gates.</li> <li>3. To have a skill to use the logic gates in designing logic circuit.</li> <li>4. To have a skill to simplify the digital circuits.</li> <li>5. To learn the simplification process, Boolean expression, Demorgans law, and Karnaugh map..</li> <li>6. To understand the principles for designing logic circuit.</li> <li>7. To understand adder, subtractor, decoder, encoder, multiplexer, demultiplexer, and comparator circuits.</li> </ol>                                                                                                                                                                                                                                                |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Recognize each type of number systems.</li> <li>2. Identify the process of converting between number systems.</li> <li>3. Summarize the types of logic gates.</li> <li>4. Discuss the use of each gate.</li> <li>5. Describe design of logic circuit by using logic gats.</li> <li>6. Explain the simplification processes.</li> <li>7. Explain Boolean expression and Demorgan's law.</li> <li>8. Explain the Karnaugh map for different numbers of bits.</li> <li>9. Discuss the design of logic circuit before and after simplification.</li> <li>10. Explain the combinational logic circuit.</li> <li>11. Identify the adder, subtractor, decoder, encoder, multiplexer, demultiplexer, comparator circuits, and code conversion.</li> <li>12. Identify the basic circuit elements and their applications</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p>--Number systems - decimal, binary, octal, and hexadecimal number system, conversion, operation. <b>[8 hrs]</b></p> <p>-Codes- excess-3,gray code, conversions, operations, complements <b>[8 hrs]</b></p> <p>--Logic gates-NOT, AND, OR, NOR, NAND, XOR, XNOR. <b>[5 hrs]</b></p> <p>--Logic simplification-Boolean theorem and Demorgans law. <b>[10 hrs]</b></p> <p>--Karnaugh map-SOP, POS, and don't care. <b>[10 hrs]</b></p> <p>--Arithmetic operations Part A- adder, parallel binary adder, subtractor, adder-subtractor<br/>.<b>[10 hrs]</b></p> <p>--Arithmetic operations Part B- multiplexer, demultiplexer, decoder, encoder, comparator, and code conversion. <b>[10 hrs]</b></p>                                                                                                               |

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على 15 اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.73 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quiz</b>            | 2           | 10% (10)         | 5, 10      | LO #1- 3, LO # 4 - 8      |
|                             | <b>Assignments</b>     | 1           | 10% (10)         | 12         | LO # 1-11                 |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous | LO # 1-12                 |
|                             | <b>Report</b>          | 1           | 10% (10)         | Continuous | LO # 1-12                 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 10         | LO # 1-10                 |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                                                          |
|----------------|---------------------------------------------------------------------------|
| <b>Week 1</b>  | Number systems (decimal, binary, octal, conversions, operations)          |
| <b>Week 2</b>  | Number systems (hexadecimal, BCD, conversions, operations)                |
| <b>Week 3</b>  | Number systems (excess-3,gray code, conversions, operations, complements) |
| <b>Week 4</b>  | Logic gates (AND,OR,NOT,NAND,NOR,XOR,XNOR)                                |
| <b>Week 5</b>  | Logic simplification (Boolean theorem)                                    |
| <b>Week 6</b>  | Logic simplification (Demorgan's theorem)                                 |
| <b>Week 7</b>  | Karnaugh maps( 2-variables,3-variables,)                                  |
| <b>Week 8</b>  | Karnaugh maps (4-variables (SOP,POS,don't care))                          |
| <b>Week 9</b>  | Karnaugh maps (5-variables, (SOP,POS,don't care))                         |
| <b>Week 10</b> | Midterm exam                                                              |
| <b>Week 11</b> | Arithmetic operations                                                     |
| <b>Week 12</b> | Arithmetic operations (decoder, encoder)                                  |
| <b>Week 13</b> | Arithmetic operations (Multiplexer, Demultiplexer)                        |
| <b>Week 14</b> | Arithmetic operations (comparators)                                       |
| <b>Week 15</b> | Arithmetic operations (code conversion)                                   |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                             |



### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|                | Material Covered                                         |
|----------------|----------------------------------------------------------|
| <b>Week 1</b>  | logic gates (NOT, AND,OR)                                |
| <b>Week 2</b>  | Logic gates (NOR.NAND)                                   |
| <b>Week 3</b>  | Logic gates (XOR,XNOR)                                   |
| <b>Week 4</b>  | Boolean theorem                                          |
| <b>Week 5</b>  | Demorgan's law                                           |
| <b>Week 6</b>  | Karnaugh map                                             |
| <b>Week 7</b>  | SOP                                                      |
| <b>Week 8</b>  | POS, don't care                                          |
| <b>Week 9</b>  | Combinational circuit (half adder, full adder)           |
| <b>Week 10</b> | Combinational circuit (Half subtractor, full subtractor) |
| <b>Week 11</b> | Decoder and Encoder circuits                             |
| <b>Week 12</b> | Multiplexer and Demultiplexer circuits                   |
| <b>Week 13</b> | Comparator circuit                                       |
| <b>Week 14</b> | Code conversion circuits                                 |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                           | Available in the Library? |
|--------------------------|--------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Digital Fundamentals by Floyed                                                 | Yes                       |
| <b>Recommended Texts</b> | Digital circuit analysis and design with Simulink modeling by Steven T. Karris | No                        |
| <b>Websites</b>          |                                                                                |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                     |                               |                                                                                                                                                                                                                                          |                    |
|------------------------------------|-------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| معلومات المادة الدراسية            |                                     |                               |                                                                                                                                                                                                                                          |                    |
| Module Title                       | Electrical Engineering Fundamentals |                               | Module Delivery                                                                                                                                                                                                                          |                    |
| Module Type                        | Core                                |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                    |
| Module Code                        | CET1102                             |                               |                                                                                                                                                                                                                                          |                    |
| ECTS Credits                       | 6                                   |                               |                                                                                                                                                                                                                                          |                    |
| SWL (hr/sem)                       | 150                                 |                               |                                                                                                                                                                                                                                          |                    |
| Module Level                       | 1                                   | Semester of Delivery          |                                                                                                                                                                                                                                          | 1                  |
| Administering Department           | CET                                 | College                       | EETC                                                                                                                                                                                                                                     |                    |
| Module Leader                      | Falah Hasan Abdulsadah              |                               | e-mail                                                                                                                                                                                                                                   | falahsci@gmail.com |
| Module Leader's Acad. Title        | lecturer                            | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |                    |
| Module Tutor                       |                                     |                               |                                                                                                                                                                                                                                          |                    |
| Peer Reviewer Name                 | Assist prof.<br>Alhamzah Taher      | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |                    |
| Scientific Committee Approval Date | 29/10/2023                          | Version Number                | 1.0                                                                                                                                                                                                                                      |                    |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>8. To develop problem solving skills and understanding of circuit theory through the application of techniques.</li> <li>9. To understand voltage, current and power from a given circuit.</li> <li>10. This course deals with the basic concept of electrical circuits.</li> <li>11. This is the basic subject for all electrical and electronic circuits.</li> <li>12. To understand Kirchhoff's current and voltage Laws problems.</li> <li>13. To perform Thevenin's Norton's Theorem.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                          |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>13. Recognize how electricity works in electrical circuits.</li> <li>14. List the various terms associated with electrical circuits.</li> <li>15. Summarize what is meant by a basic electric circuit.</li> <li>16. Discuss the reaction and involvement of atoms in electric circuits.</li> <li>17. Describe electrical power, charge, and current.</li> <li>18. Define Ohm's law.</li> <li>19. Identify the basic circuit elements and their applications.</li> <li>20. Discuss the operations of DC circuits in an electric circuit.</li> <li>21. Discuss the various properties of resistors.</li> <li>22. Explain the two Kirchhoff's laws used in circuit analysis.</li> <li>23. Identify the basic circuit elements, Maximum Power Transfer Theorem and Reciprocity Theorem.</li> <li>24. Describe Thevenin's theorem and Norton's theorem and how they work</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p>1- Definition:<br/>Symbols and Abbreviations, Units, Electric Circuit &amp; It's Element.<br/>The Direct Current Network. , Ohms law, Charge, Force, Work, Power.( <b>20 hr</b>)</p> <p>2-Circuit Theory:<br/>DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction (<b>20 hr</b>)</p> <p>3-Revision problem classes :<br/>Resistive networks, voltage and current sources, Thevenin and Norton equivalent circuits, Conversion Delta To Star Connection, Superposition</p>                                                                                                                                                                                                                  |

|                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                        | Method, Maximum Power Transfer Theorem, Reciprocity Theorem ( 20 hr)                                                                                                                                                                                                                                                                                                                                              |
| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Strategies</b>                                                      | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب                          |     |                                                                            |       |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|-------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.733 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |       |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                  |            |                           |
|---------------------------------------------------|------------------------|-------------|------------------|------------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 1           | 5% (5)           | 8          | LO #1-4 ,                 |
|                                                   | <b>Assignments</b>     | 1           | 10% (10)         | 6          | LO # 1- 11                |
|                                                   | <b>Projects / Lab.</b> | 8           | 20% (20)         | Continuous |                           |
|                                                   | <b>Report</b>          | 1           | 5% (5)           | 12         | LO # 6-11                 |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 10         | LO # 1-9                  |
|                                                   | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>                           |                        |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|                              | Material Covered                                                                      |
|------------------------------|---------------------------------------------------------------------------------------|
| <b>Week 1</b>                | Symbols And Abbreviations, Units, Electric Circuit & It's Element.                    |
| <b>Week 2</b>                | The Direct Current Network.<br>Ohms low.                                              |
| <b>Week 3 and<br/>Week 4</b> | Series Circuits (Resistance in Series) Voltage Divider Rule.                          |
| <b>Week 5</b>                | Parallel Circuits(Resistances in Parallel) Current Divider Rule.                      |
| <b>Week 6</b>                | Open and Short Circuits, Source Transformation,                                       |
| <b>Week 7</b>                | Series-Parallel Circuits Transformation.                                              |
| <b>Week 8</b>                | Kirchhoff's Laws: - Kirchhoff's current law (KCL) and. Their Use In Network Analysis. |
| <b>Week 9</b>                | Kirchhoff's voltage law (KVL).and Their Use In Network Analysis                       |
| <b>Week 10</b>               | Midterm exam                                                                          |
| <b>Week 11</b>               | Conversion Delta To Star Connection And Conversion Star To Delta Connection ,         |
| <b>Week 12</b>               | Superposition Method ,                                                                |
| <b>Week 13</b>               | Thevenin's Theorem , Norton's Theorem                                                 |
| <b>Week 14</b>               | Maximum Power Transfer Theorem                                                        |
| <b>Week 15</b>               | Reciprocity Theorem                                                                   |

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

|               | Material Covered                                                 |
|---------------|------------------------------------------------------------------|
| <b>Week 1</b> | How to use ammeter, voltmeter and ohmmeter.                      |
| <b>Week 2</b> | Apply Ohm's Law                                                  |
| <b>Week 3</b> | Apply Kirchhoff's law to measure current                         |
| <b>Week 4</b> | Apply Kirchhoff's law to measure voltages                        |
| <b>Week 5</b> | Superposition Method                                             |
| <b>Week 6</b> | Norton's Theorem.                                                |
| <b>Week 7</b> | Thévenin's Theorem.                                              |
| <b>Week 8</b> | Delta To Star Connection And Conversion Star To Delta Connection |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                               |                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                                                                                                                                                          | Available in the Library? |
| <b>Required Texts</b>                                           | Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education                                                                                                     | Yes                       |
| <b>Recommended Texts</b>                                        | DC Electrical Circuit Analysis: A Practical Approach<br>Copyright Year: 2020, dissidents.                                                                                                     | No                        |
| <b>Websites</b>                                                 | <a href="https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering">https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering</a> |                           |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                      |                      |                                                                                                                                                                                                                                          |                                |
|------------------------------------|--------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| معلومات المادة الدراسية            |                                      |                      |                                                                                                                                                                                                                                          |                                |
| Module Title                       | Mathematics I                        |                      | Module Delivery                                                                                                                                                                                                                          |                                |
| Module Type                        | Support or related learning activity |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                |
| Module Code                        | CET1103                              |                      |                                                                                                                                                                                                                                          |                                |
| ECTS Credits                       | 5                                    |                      |                                                                                                                                                                                                                                          |                                |
| SWL (hr/sem)                       | 125                                  |                      |                                                                                                                                                                                                                                          |                                |
| Module Level                       | 1                                    | Semester of Delivery |                                                                                                                                                                                                                                          | 1                              |
| Administering Department           | CET                                  | College              | EETC                                                                                                                                                                                                                                     |                                |
| Module Leader                      | zinah hayder HAMMOODI alhussein      |                      | e-mail                                                                                                                                                                                                                                   | zinah.alhusseini@altuff.edu.iq |
| Module Leader's Acad. Title        | Assistant Lecturer                   |                      | Module Leader's Qualification                                                                                                                                                                                                            | M.Sc.                          |
| Module Tutor                       |                                      |                      | e-mail                                                                                                                                                                                                                                   |                                |
| Peer Reviewer Name                 | Assist prof.<br>Alhamzah Taher       |                      | e-mail                                                                                                                                                                                                                                   | alhamza_tm@mtu.edu.iq          |
| Scientific Committee Approval Date | 29/10/2023                           |                      | Version Number                                                                                                                                                                                                                           | 1.0                            |

| Relation with other Modules       |      |  |          |  |
|-----------------------------------|------|--|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |  |          |  |
| Prerequisite module               | None |  | Semester |  |
| Co-requisites module              | None |  | Semester |  |



| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br><b>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><b>أهداف المادة الدراسية</b>                                                                               | <ol style="list-style-type: none"> <li>1. This course deals with differential and integral calculus.</li> <li>2. To develop problem solving skills and understanding of preliminaries to differential calculus.</li> <li>3. To understand differentiation, and differentiation methods.</li> <li>4. To perform applications using the derivative.</li> <li>5. To get a good grasp of Integrals, and Integration methods.</li> <li>6. To understand the relationship between differentiation and integration.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | <ol style="list-style-type: none"> <li>1. Recognize Line and Circle Equation and related evaluating formulas.</li> <li>2. List the various terms associated with Functions and their Types.</li> <li>3. Discuss the Limit and Continuity of a Function.</li> <li>4. Describe the Definition of a derivative as a limit, Differentiation Rules, and various types of Function's Derivatives.</li> <li>5. Identify when to use different Differentiation Methods.</li> <li>6. Discuss the Curve Sketching process, and the L'Hospital's Rule.</li> <li>7. Analyze Taylor and Maclaurin Series.</li> <li>8. Identify the Indefinite Integrals.</li> <li>9. Explain the Integration Methods u-substitution, By parts.</li> <li>10. Explain the Integration Methods Involving Trigonometric Functions, Trigonometric substitution.</li> <li>11. Explain the Integration Method Rational Functions by Partial Fractions.</li> <li>12. Explain the Integration Methods Functions Involving Roots, and Functions Involving Quadratics.</li> <li>13. Recognize the Definite Integral and its Application Area Under a Curve.</li> <li>14. Discuss e the Definite Integral Applications Arc Length, Average Value of a Function.</li> <li>15. Discuss the Definite Integral Applications Areas Between Two Curves.</li> </ol> |
| <b>Indicative Contents</b><br><b>المحتويات الإرشادية</b>                                                                         | <p><u>Part A - Preliminaries to differential calculus.</u></p> <p>This part includes the Line and Circle Equation and related evaluating formulas and parameters. Furthermore, main mathematical Functions characteristics Domain, Range, Odd, Even, and their Types. Finally, The Limit and Continuity of a Function Laws, the behavior At Infinity, followed by important Special Limits, then the Continuity Conditions. <b>[9 hrs]</b> + Revision problem classes in weekly tutorials <b>[3 hrs]</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><u>Part B – Differential calculus.</u></p> <p>This part will take in details the first key subject of the semester, the Differentiation process from the prospective of Definition as limit, Differentiation Rules, and Function-Derivative Table. Which will be followed by Differentiation Methods namely the Implicit, Logarithmic, and The Chain Rule. Furthermore, four Applications of differentiation will be discussed the Curve Sketching, L'Hospital's Rule, and Taylor and Maclaurin Series. <b>[12 hrs]</b> + Revision problem classes in weekly tutorials <b>[5 hrs]</b></p> <p><u>Part C – Integral calculus.</u></p> <p>This part discusses the second key subject the Integration of functions. Followed by dissecting the main Integration Methods, u-substitution, By parts, Involving Trigonometric Functions, Trigonometric substitution, Rational Functions by Partial Fractions, Functions Involving Roots, and Functions Involving Quadratics. Furthermore, it will consider six definite Integral applications, namely The Area Under a Curve, Arc Length, Average Value of a Function, and Areas Between two Curves. <b>[22 hrs]</b> + Revision problem classes in weekly tutorials <b>[8 hrs]</b></p> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>This module will primarily focus on encouraging students to participate in the activities, as well as refining and developing their critical thinking skills. This will be achieved through lectures, tutorials, discussions, and grading activities.</p> |

| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطالب موزع على 15 اسبوع</b> |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 48  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 3.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 77  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                           |      |

| Module Evaluation     |                 |             |                  |          |                           |
|-----------------------|-----------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |                 |             |                  |          |                           |
|                       |                 | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 2           | 10% (10)         | 5,10     | LO #1 - 9                 |
|                       | Assignments     | 2           | 20% (10)         | 5,10     | LO # 1 - 4, LO # 6-9      |
|                       | Projects / Lab. | N/A         |                  |          |                           |
|                       | Report          | 1           | 10% (10)         |          | LO # 1 - 14               |
| Summative assessment  | Midterm Exam    | 2 hr        | 10% (10)         | 5        | LO # 1-11                 |
|                       | Final Exam      | 3hr         | 50% (50)         | 16       | All                       |
| Total assessment      |                 |             | 100% (100 Marks) |          |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                       |
|                                 | Material Covered                                                                                                                      |
| Week 1                          | Line and Circle Equation. Functions (Domain, Range, Odd, Even, Types.)                                                                |
| Week 2                          | The Limit and Continuity of a Function (Laws, At Infinity, Special Limits, Continuity Conditions.)                                    |
| Week 3                          | Differentiation (Definition as limit, Differentiation Rules, Function-Derivative Table.)                                              |
| Week 4                          | Differentiation Methods (Implicit, Logarithmic, The Chain Rule.)                                                                      |
| Week 5                          | Midterm Exam                                                                                                                          |
| Week 6                          | Applications of Differentiation (Curve Sketching, L'Hospital's Rule.), Applications of Differentiation (Taylor and Maclaurin Series.) |
| Week 7                          | Introduction to Indefinite Integrals, Integration Methods (u-substitution, By parts.)                                                 |
| Week 8                          | Integration Methods (Involving Trigonometric Functions, Trigonometric substitution.)                                                  |

|                |                                                                                         |
|----------------|-----------------------------------------------------------------------------------------|
| <b>Week 9</b>  | <b>Integration Methods</b> (Integration of Rational Functions by Partial Fractions.)    |
| <b>Week 10</b> | <b>Midterm Exam</b>                                                                     |
| <b>Week 11</b> | <b>Integration Methods</b> (Functions Involving Roots, Functions Involving Quadratics.) |
| <b>Week 12</b> | <b>Midterm Exam</b>                                                                     |
| <b>Week 13</b> | <b>Definite Integral and Applications</b> (Definite Integral, Area Under a Curve.)      |
| <b>Week 14</b> | <b>Definite Integral and Applications</b> (Arc Length, Average Value of a Function.)    |
| <b>Week 15</b> | <b>Definite Integral and Applications</b> (Areas Between two Curves)                    |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                           |

### Delivery Plan (Weekly Tutorial)

المنهاج الاسبوعي الاضافي

|                                                                                                                      | Material Covered |
|----------------------------------------------------------------------------------------------------------------------|------------------|
| Each week, a question sheet related to the material presented in the theoretical lecture will be solved and debated. |                  |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                        | Available in the Library? |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Joel R. Hass, Christopher E. Heil, Maurice D. Weir, "Thomas' Calculus: Early Transcendentals", Pearson Education, 14th Edition, (January 1, 2017), ISBN-13: 978-0134439020. | Yes                       |
| <b>Recommended Texts</b> | Anthony Croft, Robert Davison, "Mathematics for Engineers: A Modern Interactive Approach", Prentice Hall, 3rd edition, (January 1, 2008), ISBN-13: 978-0132051569.          | No                        |
| <b>Websites</b>          | <a href="https://www.khanacademy.org/math/differential-calculus">https://www.khanacademy.org/math/differential-calculus</a>                                                 |                           |

### Grading Scheme

مخطط الدرجات

| Group                                     | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group</b><br><b>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                           | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                           | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                           | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                           | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br><b>(0 – 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                           | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                           |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                      |                      |                                                                                                                                                                                                                               |                                 |
|------------------------------------|--------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| معلومات المادة الدراسية            |                                      |                      |                                                                                                                                                                                                                               |                                 |
| Module Title                       | Engineering Drawing                  |                      | Module Delivery                                                                                                                                                                                                               |                                 |
| Module Type                        | Support or related learning activity |                      | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                 |
| Module Code                        | CET1104                              |                      |                                                                                                                                                                                                                               |                                 |
| ECTS Credits                       | 5                                    |                      |                                                                                                                                                                                                                               |                                 |
| SWL (hr/sem)                       | 125                                  |                      |                                                                                                                                                                                                                               |                                 |
| Module Level                       | 1                                    | Semester of Delivery |                                                                                                                                                                                                                               | 1                               |
| Administering Department           | CET                                  | College              | EETC                                                                                                                                                                                                                          |                                 |
| Module Leader                      | Rania Ali Hamoodi                    |                      | e-mail                                                                                                                                                                                                                        | rania.ali.hamoodi@altuff.edu.iq |
| Module Leader's Acad. Title        | Asst. lecturer                       |                      | Module Leader's Qualification                                                                                                                                                                                                 | MSC.                            |
| Module Tutor                       |                                      |                      |                                                                                                                                                                                                                               |                                 |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud           |                      | e-mail                                                                                                                                                                                                                        | mahmoud.shukur@mtu.edu.iq       |
| Scientific Committee Approval Date | 29/10/2023                           |                      | Version Number                                                                                                                                                                                                                | 1.0                             |

| Relation with other Modules       |      |  |          |  |
|-----------------------------------|------|--|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |  |          |  |
| Prerequisite module               | None |  | Semester |  |
| Co-requisites module              | None |  | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>14. To develop spatial visualization skills: Enhance your ability to visualize and mentally manipulate objects in three-dimensional space based on two-dimensional drawings. Strengthen your spatial awareness and improve your understanding of complex engineering design</p> <p>15. Learn sketching and taking field dimensions.</p> <p>16. Take data and transform it into graphic drawings.</p> <p>17. Learn basic engineering drawing formats.</p> <p>18. Learn basic AutoCAD skills.</p> <p>19. Learn how to draw 2D drawings in AutoCAD.</p>                                                                                                                                                                                                                                                                                                                     |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>25. Identify the basic of AutoCAD</p> <p>26. Explain Drawing settings</p> <p>27. How to drawing: Point, Line, Multiline, P line, Spline, X line, Rectangle.</p> <p>28. How to drawing: Donut, Polygon, Circle, Arc, Ellipse</p> <p>29. List Modify Tools</p> <p>Identify: Erase, Undo, Redo, Explode, Move, Copy, Rotate, Mirror,</p> <p>30. Identify Array, Align, Scale, Stretch, Lengthen, Trim, Extend, Break, Join, Chamfer, Fillet.</p> <p>31. Explain Zoom, Pan.</p> <p>32. How to assign: Dimension - Linear, Aligned, Radius, Diameter, Center Mark, Angle, Arc length, Continuous, Baseline, Tolerance, Dimension Space, Dimension Break, Jogged radius, Ordinate dimensions.</p> <p>33. Dealing with: Text, Style, M text, Scale text, Spell,</p> <p>34. Knowing the Hatching Objects.</p> <p>35. Drawing 3d modeling.</p> <p>36. Drawing the Exercises .</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p>--<b>AutoCAD Software</b>, drawing settings, Drawing Tools, Line, Circle, Arc, Ellipse, Donut, Polygon, Rectangle, Point, Multiline, P line, Spline, X line. <b>[20 hrs.]</b></p> <p>--<b>Modify Tools</b></p> <p>Erase, Undo, Redo, Explode, Move, Copy, Rotate, Mirror, Array, Align, Scale, Stretch, Lengthen, Trim, Extend, Break, Join, Chamfer, Fillet. <b>[4 hrs.]</b></p> <p>--<b>Display Control</b> Zoom, Pan, Redraw, Clean Screen. <b>[4 hrs.]</b></p> <p>--<b>Dimension</b> - Linear, Aligned, Radius, Diameter, Center Mark, Angle, Arc length,</p>                                                                                                                                                                                                                                                      |

|  |                                                                                                                                                                                                                                                                                                                |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Continuous, Baseline, Tolerance, Dimension Space, Dimension Break, Jogged radius, Ordinate dimensions. <b>[4 hrs.]</b></p> <p>--Hatching Objects <b>[4hrs]</b></p> <p>--Text, Style, M text, Scale text, Spell, <b>[4 hrs.]</b></p> <p>--<b>3D MODELLING, Convert 2D to 3D, Solid Editing [20 hrs.]</b></p> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <ol style="list-style-type: none"> <li>1. Familiarize with the Software: Before diving into engineering drawing concepts, it's important to become familiar with the AutoCAD software. This includes understanding the user interface, basic tools, and commands. with introductory tutorials or online resources that cover the basics of AutoCAD.</li> <li>2. Step-by-Step Instructions: Break down complex drawing tasks into smaller, manageable steps. Provide step-by-step instructions and demonstrations using AutoCAD, showing students how to execute each step effectively. This approach helps students understand the workflow and build their confidence.</li> <li>3. Visual Aids and Examples: Utilize visual aids, such as slides, diagrams, and examples, to reinforce concepts. Show real-world engineering drawings and explain how they were created using AutoCAD. Visual representations can enhance understanding and make abstract concepts more tangible.</li> <li>4. Group Activities and Collaboration: Promote collaboration among students by assigning group activities or projects. This allows them to work together, share knowledge, and learn from one another. Encourage students to discuss their approaches and problem-solving techniques related to engineering drawing in AutoCAD.</li> <li>5. Provide Feedback: Regularly provide constructive feedback on students' drawings. Highlight areas for improvement, suggest alternative methods, and point out common mistakes. This feedback loop is crucial for students to refine their skills and develop a deeper understanding of engineering drawing principles.</li> </ol> |



| Student Workload (SWL)<br>الحمل الدراسي للطالب موزع على 15 اسبوع        |     |                                                                    |      |
|-------------------------------------------------------------------------|-----|--------------------------------------------------------------------|------|
| Structured SWL (h/sem)<br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 48  | Structured SWL (h/w)<br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 3.2  |
| Unstructured SWL (h/sem)<br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 77  | Unstructured SWL (h/w)<br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5.13 |
| Total SWL (h/sem)<br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                    |      |

| Module Evaluation<br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|--------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                            |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                       | Quizzes         | 2           | 10% (10)         | 5, 11      | LO #1-3, 4 and 11         |
|                                            | Assignments     | 2           | 10% (10)         | 4,11       | 1-3 , 3-10                |
|                                            | Projects / Lab. | 10          | 20% (20)         | Continuous |                           |
|                                            | Report          |             |                  |            |                           |
| Summative assessment                       | Midterm Exam    | 3 hr        | 10% (10)         | 7          | LO # 1-7                  |
|                                            | Final Exam      | 3hr         | 50% (50)         | 16         | All                       |
| Total assessment                           |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Lab. Syllabus)<br>المنهاج الاسبوعي للمختبر |                                                                  |
|------------------------------------------------------------------|------------------------------------------------------------------|
|                                                                  | Material Covered                                                 |
| Week 1                                                           | Introducing of Engineering Drawing                               |
| Week 2                                                           | Drawing settings of AutoCAD                                      |
| Week 3                                                           | Drawing Tools<br>Point, Line ,Multiline, P line, Spline, X line. |

|                   |                                                                                                                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 4</b>     | Rectangle, Donut, Polygon                                                                                                                                                                                       |
| <b>Week 5</b>     | Circle, Arc, Ellipse                                                                                                                                                                                            |
| <b>Week 6</b>     | Modify Tools<br>Erase, Undo, Redo, Explode, Move, Copy, Rotate, Mirror, Array, Align, Scale, Stretch, Lengthen, Trim, Extend, Break, Join, Chamfer, Fillet. Display Control<br>Zoom, Pan, Redraw, Clean Screen. |
| <b>Week 7</b>     | Mid exam                                                                                                                                                                                                        |
| <b>Week 8</b>     | Dimension - Linear, Aligned, Radius, Diameter, Center Mark, Angle, Arc length, Continuous, Baseline, Tolerance, Dimension Space, Dimension Break, Jogged radius, Ordinate dimensions                            |
| <b>Week 9</b>     | Annotation Tools<br>Text, Style, M text, Scale text, Spell                                                                                                                                                      |
| <b>Week 10</b>    | Hatching Objects                                                                                                                                                                                                |
| <b>Week 11,12</b> | 3D modeling                                                                                                                                                                                                     |
| <b>Week13</b>     | Convert 2D To 3D                                                                                                                                                                                                |
| <b>Week 14</b>    | Solid Editing                                                                                                                                                                                                   |
| <b>Week 15</b>    | Exercises drawing                                                                                                                                                                                               |
| <b>Week 16</b>    | Preparatory week before the final Exam                                                                                                                                                                          |

| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                              |                                  |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------|
|                                                                        | <b>Text</b>                                                                                  | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                                  | Introduction to AutoCAD 2010<br>By Alf Yarwood<br>Copyright 2009                             | Yes                              |
| <b>Recommended Texts</b>                                               | An Introduction to Autodesk Inventor 2010 and AutoCAD<br>2010 Unbnd Edition<br>by Randy Shih | No                               |
| <b>Websites</b>                                                        |                                                                                              |                                  |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                      |                               |                                                                                                                                                                                                                               |
|------------------------------------|--------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                      |                               |                                                                                                                                                                                                                               |
| Module Title                       | Engineering Workshops                |                               | Module Delivery                                                                                                                                                                                                               |
| Module Type                        | Support or related learning activity |                               | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET1105                              |                               |                                                                                                                                                                                                                               |
| ECTS Credits                       | 6                                    |                               |                                                                                                                                                                                                                               |
| SWL (hr/sem)                       | 150                                  |                               |                                                                                                                                                                                                                               |
| Module Level                       | 1                                    | Semester of Delivery          |                                                                                                                                                                                                                               |
| Administering Department           | CET                                  | College                       | EETC                                                                                                                                                                                                                          |
| Module Leader                      | Kadhim Sameer Ibrahim                | e-mail                        | khadum.sameer@altuff.edu.iq                                                                                                                                                                                                   |
| Module Leader's Acad. Title        | Lecturer                             | Module Leader's Qualification | MSc                                                                                                                                                                                                                           |
| Module Tutor                       |                                      | e-mail                        |                                                                                                                                                                                                                               |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud           | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                     |
| Scientific Committee Approval Date | 29/10/2023                           | Version Number                | 1.0                                                                                                                                                                                                                           |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>The objective of studying Electrical, Electronic, and Mechanical workshops is to enable students to acquire the necessary skills and knowledge to deal with electrical, electronic, and mechanical systems and devices. This subject aims to teach students how to diagnose faults, repair systems, and perform maintenance on these systems and devices.</p> <p>By studying Electrical, Electronic, and Mechanical workshops, students can understand the principles of electricity, electronics, and mechanics, as well as how to read engineering diagrams and use various tools and equipment to work on them. They also learn how to diagnose faults, repair them, and properly maintain different devices in a safe manner.</p> <p>In general, studying this subject aims to prepare students to become skilled technicians in the field of electrical, electronic, and mechanical engineering. They can work in areas such as industrial maintenance and repair, electrical and electronic installations, automation and robotics, medical devices, and other modern technologies</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>The learning outcomes of studying Electrical, Electronic, and Mechanical workshops include:</p> <ol style="list-style-type: none"> <li>1. Acquisition of diagnostic and repair skills: Students learn how to analyze problems, identify faults in electrical, electronic, and mechanical systems, and implement appropriate repair procedures.</li> <li>2. Understanding of electrical, electronic, and mechanical principles: Students gain knowledge of engineering and technical fundamentals related to electricity, electronics, and mechanics, including reading engineering diagrams and practical understanding of circuits, electronic devices, and mechanical components.</li> <li>3. Development of practical work skills: Students have the opportunity to learn hands-on and practice using various tools and equipment used in electrical, electronic, and mechanical workshops.</li> <li>4. Ability to perform preventive maintenance: Students learn how to maintain systems and devices and carry out preventive maintenance to ensure proper and sustainable performance.</li> <li>5. Enhancement of teamwork and communication skills: Studying Electrical, Electronic, and Mechanical workshops promotes collaboration among students and the ability to work as a team in problem-solving and executing practical projects.</li> <li>6. Knowledge and Understanding: a. Demonstrate a comprehensive understanding of the principles and concepts related to electrical and mechanical workshop operations. b. Identify and explain the safety measures and regulations</li> </ol> |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                              | <p>applicable to electrical and mechanical workshops.</p> <p>7. Describe the different tools, machines, and materials used in electrical and mechanical workshops.</p> <p>8. Practical Skills: a. Apply safe working practices and use appropriate personal protective equipment (PPE) in electrical and mechanical workshop environments. b. Demonstrate proficiency in using various tools and equipment for turning, filing, drilling, welding, and assembly.</p> <p>9. Perform practical tasks related to electrical and mechanical workshop operations accurately and efficiently. d. Apply problem-solving techniques to troubleshoot and rectify common issues encountered in electrical and mechanical workshop activities.</p> <p>10. Critical Thinking and Analysis: a. Analyze and evaluate different turning processes, instrumentation measures, and cutting tools used in the workshop. b. Assess the quality of filing processes and choose appropriate rasps and tools for different filing tasks.</p> <p>11. Evaluate the drilling processes and select suitable drilling tools based on specific requirements. d. Analyze welding processes, including oxy-acetylene and arc welding, and determine safety precautions and best practices.</p> <p>12. Communication and Collaboration: a. Effectively communicate and collaborate with peers in group projects and workshop activities. b. Present findings, results, and recommendations related to electrical and mechanical workshop tasks in a clear and concise manner.</p> <p>13. Professional and Ethical Responsibility: a. Demonstrate ethical behavior and responsibility in adhering to safety regulations, environmental considerations, and industry standards in electrical and mechanical workshop practices</p> <p>14. Overall, studying this subject prepares students to enter the job market in various technical and engineering fields, such as industrial maintenance, electrical and electronic installations, automation and robotics, medical devices, and other modern technologies.</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><u>Part A – Electronic workshop</u></p> <p>In this part, we will learn how to check the elements in the electrical circuits, what is the way each element works, how to check it, and find out what is damaged and replace it. <b>[14 hrs.]</b></p> <p>We will also talk about conductors and semiconductors <b>[10 hrs.]</b></p> <p><u>Part B – Electrical workshop</u></p> <ol style="list-style-type: none"> <li>1. Principles of Industrial Safety in Electrical Workshops <b>[4 hrs.]</b></li> <li>2. Tools Used in Electrical Workshops <b>[5 hrs.]</b>.</li> <li>3. Power Sources and Characteristics <b>[5 hrs.]</b></li> <li>4. Multimeter and Wire Size Measurement <b>[5 hrs.]</b></li> </ol> <p><u>Part C – Mechanical workshop</u></p> <ol style="list-style-type: none"> <li>1. Different Types of Welding Irons and Spot Welding <b>[4 hrs.]</b></li> <li>2. Electric Transformers <b>[5 hrs.]</b></li> <li>3. Electric Circuits and Transformer Operation <b>[5 hrs.]</b>.</li> <li>4. Types of Electric Motors <b>[5 hrs.]</b></li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through labs, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على 15 اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.73 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 5, 11      | LO #1-4, LO #8-11         |
|                             | <b>Assignments</b>     | 1           | 5% (10)          | 12         | LO # 1-14                 |
|                             | <b>Projects / Lab.</b> | 2           | 20% (10)         | Continuous | ALL                       |
|                             | <b>Report</b>          | 1           | 5% (10)          | 13         | ALL                       |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 4 hr        | 10% (10)         | 8          | LO # 1-7                  |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

## Electronic, Electrical , Mechanical Workshops

|            | Material Covered                                                                                                                                                                                                                                                                    |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1,2   | <ul style="list-style-type: none"> <li>❖ Use different measuring devices in the workshop</li> <li>❖ 1- Principles of Industrial Safety in Electrical Workshops.</li> <li>2- Different Types of Welding Irons (with different capacities) and Spot Welding</li> </ul>                |
| Week 3,4   | <ul style="list-style-type: none"> <li>❖ How to use irons, types of soldering used, and how to use absorbent soldering irons</li> <li>❖ 1- Electric Circuits and Transformer Operation.</li> <li>2- Electrical Installations and Types of Wiring (Surface and Concealed)</li> </ul> |
| Week 5,6,7 | <ul style="list-style-type: none"> <li>❖ Electronic components (resistor , inductors , capacitors)</li> <li>❖ 1- ONE LAMP CONTROLLED BY ONE SWITCH</li> <li>2- Parallel Wiring of Two Lamps with a Switch and Socket</li> </ul>                                                     |
| Week 8     | ❖ Midterm Exam                                                                                                                                                                                                                                                                      |
| Week 9 ,10 | <p>Electronic components (resistor , inductors , capacitors)</p> <p>Drawing a Staircase Lamp (Two-Way Switch) Circuit</p>                                                                                                                                                           |
| Week 11,12 | <ul style="list-style-type: none"> <li>❖ Electronic components (Battery , jumper, fuse, push button, switch, rotary switch)</li> <li>❖ 1- Introduction to Workshop Safety</li> <li>2- Turning Process and Instrumentation Measures</li> </ul>                                       |
| Week 13,14 | <ul style="list-style-type: none"> <li>❖ Electronic components (Diode , Transistor, Transformer)</li> <li>❖ 1- Cutting Tools</li> <li>2- Practical Exercise - Horizontal Turning</li> </ul>                                                                                         |
| Week 15    | <ul style="list-style-type: none"> <li>❖ using bread board and Vero board, Building a Circuit on Breadboard, Building a Circuit on Vero board</li> <li>❖ 1- Turning Different Shapes</li> <li>2- Introduction to Filing Process ( practical Exercise)</li> </ul>                    |
| Week 16    | Final Exam                                                                                                                                                                                                                                                                          |

## Learning and Teaching Resources



| مصادر التعلم والتدريس |                                                                                                                                                       |                           |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                       | Text                                                                                                                                                  | Available in the Library? |
| Required Texts        | 1-Encyclopedia of Electronic Components Volume 1 (Charles Platt).<br>2- J. Smith and E. Johnson, "Electrical Engineering Workshop:Theory and Practice | Yes / online              |
| Recommended Texts     |                                                                                                                                                       | No                        |
| Websites              |                                                                                                                                                       |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                           |                               |                                                                                                                                                                                                                                          |
|------------------------------------|---------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                           |                               |                                                                                                                                                                                                                                          |
| Module Title                       | English Language I        |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Basic learning activities |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | MTU1002                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 2                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 50                        |                               |                                                                                                                                                                                                                                          |
|                                    |                           |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 1                         | Semester of Delivery          | 1                                                                                                                                                                                                                                        |
| Administering Department           | CET                       | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Rania Ali Hamoodi         | e-mail                        | rania.ali.hamoodi@altuff.edu.iq                                                                                                                                                                                                          |
| Module Leader's Acad. Title        | Asst. lecturer            | Module Leader's Qualification | MSC.                                                                                                                                                                                                                                     |
| Module Tutor                       |                           |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein   | e-mail                        | Osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 29/10/2023                | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br>أهداف المادة الدراسية                | <ol style="list-style-type: none"> <li>1. know students with essential information in the English language in association with reading, writing and speaking skills, and knowing more English vocabulary.</li> <li>2. To understand pronouns, questions and short answers, tenses (present, past and future), adjective, adverb, prepositions of place, punctuation marks and practicing writing.</li> <li>3. This module works towards enhancing students' English language competencies along with their technical or professional knowledge.</li> <li>4. Enhance students' communication skills in English can result in better job opportunities in the future</li> </ol>                                                     |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>The student will have the ability to:</p> <ol style="list-style-type: none"> <li>1. Know the English skills of reading, and writing.</li> <li>2. Recognize other English language skills such as: grammar, vocabulary.</li> <li>3. Understand and appreciate the importance of grammar aspects and vocabulary to increase the ability of communicating ideas about the English language.</li> <li>4. Understand pronouns, questions and short answers.</li> <li>5. Understand tenses present, past and future.</li> <li>6. Understand adjectives, adverbs, prepositions of place, and punctuation marks.</li> <li>7. Practicing reading and writing.</li> <li>8. Enhance students' communication skills in English.</li> </ol> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p><b><u>Part A: Parts of Sentence.</u></b></p> <p>Pronoun, question and short answer, adjective, adverb, prepositions of place. [14 hrs]</p> <p><b><u>Part B: Tenses</u></b></p> <p>Past Tense, Present Tense, and Future Tense. [8 hrs]</p> <p><b><u>Part C: Reading and Writing</u></b></p> <p>Punctuation marks, and practicing writing [8 hrs]</p>                                                                                                                                                                                                                                                                                                                         |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                         |
|-------------------|-------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategies that will be adopted in delivering this module are: |
|-------------------|-------------------------------------------------------------------------|

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>- Allow students to actively participate in the learning process with class discussions and exercises that support the initiative.</li> <li>- Use didactic questioning through questions to determine student understanding of the material.</li> <li>- Writing an assignment and report that encourages students to clarify and organize their thinking and independently research and present on a topic.</li> </ul> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Student Workload (SWL)                                                         |    |                                                                           |      |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|------|
| الحمل الدراسي للطلاب محسوب لـ ١٥ أسبوعا                                        |    |                                                                           |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 33 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 2.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 17 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 1.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 50 |                                                                           |      |

| Module Evaluation     |                 |             |                  |          |                           |
|-----------------------|-----------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |                 |             |                  |          |                           |
|                       |                 | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 2           | 20% (20)         | 5, 10    | LO # 1-3 , 4- 7           |
|                       | Assignments     | 2           | 10% (10)         | Cont.    | LO # 1- 7                 |
|                       | Projects / Lab. |             |                  |          |                           |
|                       | Report          | 1           | 10% (10)         | 14       | 1-8                       |
| Summative assessment  | Midterm Exam    | 2 hours     | 10% (10)         | 8        | LO # 1-5                  |
|                       | Final Exam      | 3 hours     | 50% (50)         | 16       | All                       |
| Total assessment      |                 |             | 100% (100 Marks) |          |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                                                                                             |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | Material Covered                                                                                                                                                                                            |
| Week 1                                                            | <b>Unit 1:</b> Grammar: Types of Pronouns<br>Vocabulary: Everyday objects, Plurals<br>Reading and Writing Skill                                                                                             |
| Week 2                                                            | <b>Unit 2:</b> Grammar: Pronoun, Questions<br>Vocabulary: Countries, Adjective and Nouns<br>Reading and Writing Skill                                                                                       |
| Week 3                                                            | <b>Unit 3:</b> Grammar: Negatives, Questions and short answer<br>Vocabulary: Jobs, Personal Information<br>Reading and Writing Skill                                                                        |
| Week 4                                                            | <b>Unit 4:</b> Grammar: Possessive adjectives, Possessive 's, common verbs (1): has/have, love, like, work.<br>Vocabulary: The family, The alphabet<br>Reading and Writing Skill                            |
| Week 5                                                            | <b>Unit 5:</b> Present Simple, Questions<br>Vocabulary: Sport, Food and Drink, Verb phrase, Languages and nationalities, Adjective + noun.<br>Reading and Writing Skill                                     |
| Week 6                                                            | <b>Unit 6:</b> Grammar: Adverbs of frequency (sometimes, always, never), Questions and Negatives.<br>Vocabulary: The Time, Word that go together<br>Reading and Writing Skill                               |
| Week 7                                                            | <b>Unit 7:</b> Grammar: Question words, Pronouns (subject, object, possessive), that and this.<br>Vocabulary: Adjectives<br>Reading and Writing Skill<br>Grammar: There is/There are, Prepositions of place |

|                |                                                                                                                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Vocabulary: Rooms and furniture, Place of town<br>Reading and Writing Skill                                                                                                                    |
| <b>Week 8</b>  | <b>Mid exam</b>                                                                                                                                                                                |
| <b>Week 9</b>  | <b>Unit 9:</b> Grammar: Past Simple Tense - regular verbs<br>Vocabulary: years, have, do, go<br>Reading and Writing Skill                                                                      |
| <b>Week 10</b> | <b>Unit 10:</b> Grammar: Past Simple Tense - irregular verbs, Questions and Negatives, Time expression, ago.<br>Vocabulary: Weekend activities, Sport and leisure<br>Reading and Writing Skill |
| <b>Week 11</b> | <b>Unit 11:</b> Grammar: can/can't, Adverbs, Request and offers.<br>Vocabulary: Verb + noun, Adjective + noun, Opposite adjective<br>Reading and Writing Skill                                 |
| <b>Week 12</b> | <b>Unit 12:</b> Grammar: Would like, some and any, like and would like<br>Vocabulary: Places and town, In cafe<br>Reading and Writing Skill                                                    |
| <b>Week 13</b> | <b>Unit 13:</b> Grammar: Present Continuous Tense<br>Vocabulary: Colors, Clothes, Opposite verbs<br>Reading and Writing Skill                                                                  |
| <b>Week 14</b> | <b>Unit 14:</b> Grammar: Future Tense, going to<br>Vocabulary: Forms of transport<br>Reading and Writing Skill                                                                                 |
| <b>Week 15</b> | Grammar: Punctuation Marks, Grammar revision<br>Vocabulary: Vocabulary revision<br>Reading and Writing Skill                                                                                   |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                                                                  |

| Learning and Teaching Resources |                                                                                                 |                           |
|---------------------------------|-------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                 |                           |
|                                 | Text                                                                                            | Available in the Library? |
| Required Texts                  | New Headway Plus/ Beginner, John and Liz Soars, Oxford University Press                         | No                        |
| Recommended Texts               | Understanding and Using English Grammar, 5 <sup>th</sup> Edition, Betty S. Azar Stacy A. Hagen. | No                        |
| Websites                        |                                                                                                 |                           |

| Grading Scheme              |                  |                     |          |                                       |
|-----------------------------|------------------|---------------------|----------|---------------------------------------|
| مخطط الدرجات                |                  |                     |          |                                       |
| Group                       | Grade            | التقدير             | Marks %  | Definition                            |
| Success Group<br>(50 - 100) | A - Excellent    | امتياز              | 90 - 100 | Outstanding Performance               |
|                             | B - Very Good    | جيد جدا             | 80 - 89  | Above average with some errors        |
|                             | C - Good         | جيد                 | 70 - 79  | Sound works with notable errors       |
|                             | D - Satisfactory | متوسط               | 60 - 69  | Fair but with major shortcomings      |
|                             | E - Sufficient   | مقبول               | 50 - 59  | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)      | FX – Fail        | راسب (قيد المعالجة) | (45-49)  | More work required but credit awarded |
|                             | F – Fail         | راسب                | (0-44)   | Considerable amount of work required  |
|                             |                  |                     |          |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                |                               |                                                                  |
|------------------------------------|--------------------------------|-------------------------------|------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                |                               |                                                                  |
| Module Title                       | Digital Systems                |                               | Module Delivery                                                  |
| Module Type                        | Core                           |                               | ✓ Theory<br>Lecture<br>✓ Lab<br>Tutorial<br>Practical<br>Seminar |
| Module Code                        | CET1201                        |                               |                                                                  |
| ECTS Credits                       | 6                              |                               |                                                                  |
| SWL (hr/sem)                       | 150                            |                               |                                                                  |
| Module Level                       | 1                              | Semester of Delivery          | 2                                                                |
| Administering Department           | CET                            | College                       | EETC                                                             |
| Module Leader                      | Dawood Sallem Hussian          | e-mail                        | dawood.hussian@altuff.edu.iq                                     |
| Module Leader's Acad. Title        | Lecturer                       | Module Leader's Qualification | Msc.                                                             |
| Module Tutor                       |                                | e-mail                        |                                                                  |
| Peer Reviewer Name                 | Assist prof.<br>Alhamzah Taher | e-mail                        | alhamza_tm@mtu.edu.iq                                            |
| Scientific Committee Approval Date | 29/10/2023                     | Version Number                | 1.0                                                              |

| Relation with other Modules       |         |          |   |
|-----------------------------------|---------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |         |          |   |
| Prerequisite module               | CET1101 | Semester | 1 |
| Co-requisites module              | None    | Semester |   |



## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>20. To understand the flip flop operation.</p> <p>21. To understand the latches operation.</p> <p>22. This course deals with the designing of logic systems.</p> <p>23. To understand the principles of counter circuits.</p> <p>24. To understand the shift registers.</p> <p>25. To have a skill to design ADC and DAC.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>37. Discuss the flip-flops.</p> <p>38. Recognize the differences between flip-flops and latches.</p> <p>39. List the applications of flip-flops.</p> <p>40. Summarize what is meant by the logic systems.</p> <p>41. Explain the counter circuits and discuss the difference between synchronous and asynchronous counter.</p> <p>42. Discuss the types of asynchronous counter circuits.</p> <p>43. Discuss the types of synchronous circuit.</p> <p>44. Identify the shift registers.</p> <p>45. Discuss the operations of each types of shift registers.</p> <p>46. Discuss the shift register counter.</p> <p>47. Explain the principles of ADC and DAC.</p> <p>48. Explain the design for each type of ADC and DAC.</p>                                                                                                                                                                 |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p>--Flip-Flops – SR latch, T latch, D latch. <b>[10 hrs]</b></p> <p>--Flip-Flops- JK FF, edge triggered, and conversion from one type to another. <b>[10 hrs]</b></p> <p>--Counters- Asynchronous, synchronous counters, Decade, up-down counters, and counter decoding. <b>[15 hrs]</b></p> <p>--Shift-registers - serial in/serial out, serial in/parallel out, parallel in/serial out, parallel in/parallel out, bidirectional , shift register counter (Johnson counter, Ring counter)) <b>[10 hrs]</b></p> <p>--Multivibrators- definition, astable, bistable, mono-stable, and 555 timer <b>[5 hrs]</b></p> <p>--A/D convertors modeling -flash ADC, tacking ADC, slope ADC ,successive approximation ADC, digital ramp ADC, delta sigma ADC. <b>[5 hrs]</b></p> <p>--D/A convertors modeling -R/2R DAC, R/2nR DAC. <b>[5 hrs]</b></p> |
| <p><b>Learning and Teaching Strategies</b></p>                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

الحمل الدراسي للطالب موزعة على 15 اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.73 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |      |

## Module Evaluation

تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 1           | 10% (10)         | 8          | LO #1-7                   |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 4, 10      | LO # 1, 3, LO # 3- 8      |
|                             | <b>Projects / Lab.</b> | 10          | 10% (1)          | Continuous | LO # 1-14                 |
|                             | <b>Report</b>          | 10          | 10% (1)          | Continuous | LO # 1-14                 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 10         | LO # 1-10                 |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|               | Material Covered                          |
|---------------|-------------------------------------------|
| <b>Week 1</b> | Flip-flops and latches(SR latch, D latch) |

|                |                                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Week 2</b>  | Flip-Flops(T-latch, JK )                                                                                            |
| <b>Week 3</b>  | Flip-Flops(edge triggered, master-slave)                                                                            |
| <b>Week 4</b>  | Flip-flops (conversion from one type to another, flip flop applications)                                            |
| <b>Week 5</b>  | Asynchronous counter                                                                                                |
| <b>Week 6</b>  | Synchronous counter                                                                                                 |
| <b>Week 7</b>  | Decade, up-down counter                                                                                             |
| <b>Week 8</b>  | Cascade counter, Counter decoding                                                                                   |
| <b>Week 9</b>  | Shift-registers (serial in/serial out, serial in/parallel out, parallel in/serial out, parallel in/parallel out)    |
| <b>Week 10</b> | Midterm exam                                                                                                        |
| <b>Week 11</b> | Shift-registers (bidirectional , shift register counter), Johnson counter, Ring counter                             |
| <b>Week 12</b> | Multivibrators (definition, astable, bistable)                                                                      |
| <b>Week 13</b> | Multivibrators (monostable, 555 timer)                                                                              |
| <b>Week 14</b> | A/D convertors (flash ADC, tacking ADC, slope ADC ,successive approximation ADC, digital ramp ADC, delta sigma ADC) |
| <b>Week 15</b> | D/A convertors ( $R/2R$ DAC, $R/2^nR$ DAC)                                                                          |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                       |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | <b>Material Covered</b>                                       |
|---------------|---------------------------------------------------------------|
| <b>Week 1</b> | SR ff, T ff                                                   |
| <b>Week 2</b> | D ff, JK ff                                                   |
| <b>Week 3</b> | Master-slave ff                                               |
| <b>Week 4</b> | asynchronous counter (2-bit,3-bit)                            |
| <b>Week 5</b> | asynchronous counter(4-bit, modulus counter)                  |
| <b>Week 6</b> | synchronous counter (2-bit, 3-bit)                            |
| <b>Week 7</b> | synchronous counter ( decade, up-down counter)                |
| <b>Week 8</b> | Cascade counter, counter decoding                             |
| <b>Week 9</b> | Serial in-serial out, parallel in-parallel out shift register |

|                |                                                    |
|----------------|----------------------------------------------------|
| <b>Week 10</b> | Serial in-parallel out, parallel in- serial out SR |
| <b>Week 11</b> | Johnson counter, ring counter                      |
| <b>Week 12</b> | multivibrator                                      |
| <b>Week 13</b> | Analogue to digital convertor                      |
| <b>Week 14</b> | Digital to analogue convertor                      |

| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                                                                                                                               |                                  |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                        | <b>Text</b>                                                                                                                                                                                   | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                                  | Digital Fundamentals by Floyed                                                                                                                                                                | Yes                              |
| <b>Recommended Texts</b>                                               | Digital circuit analysis and design with Simulink modeling by Steven T. Karris                                                                                                                | No                               |
| <b>Websites</b>                                                        | <a href="https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering">https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering</a> |                                  |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b>                                                                                                                                                                                                                                                                                                                                         |                         |                     |                  |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| <b>Group</b>                                                                                                                                                                                                                                                                                                                                                                         | <b>Grade</b>            | <b>التقدير</b>      | <b>Marks (%)</b> | <b>Definition</b>                     |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100         | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89          | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79          | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69          | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59          | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)          | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)           | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |                  |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |                  |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                |                               |                                                                                                                                                                                                                                          |                    |
|------------------------------------|--------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| معلومات المادة الدراسية            |                                |                               |                                                                                                                                                                                                                                          |                    |
| Module Title                       | Electrical Circuits            |                               | Module Delivery                                                                                                                                                                                                                          |                    |
| Module Type                        | Core                           |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                    |
| Module Code                        | CET1202                        |                               |                                                                                                                                                                                                                                          |                    |
| ECTS Credits                       | 6                              |                               |                                                                                                                                                                                                                                          |                    |
| SWL (hr/sem)                       | 150                            |                               |                                                                                                                                                                                                                                          |                    |
| Module Level                       | 1                              | Semester of Delivery          |                                                                                                                                                                                                                                          | 2                  |
| Administering Department           | CET                            | College                       | EETC                                                                                                                                                                                                                                     |                    |
| Module Leader                      | Falah Hasan Abdulsadah         |                               | e-mail                                                                                                                                                                                                                                   | falahsci@gmail.com |
| Module Leader's Acad. Title        | lecturer                       | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |                    |
| Module Tutor                       |                                |                               | e-mail                                                                                                                                                                                                                                   |                    |
| Peer Reviewer Name                 | Assist prof.<br>Alhamzah Taher | e-mail                        | alhamza_tm@yahoo.com                                                                                                                                                                                                                     |                    |
| Scientific Committee Approval Date | 29/10/2023                     | Version Number                | 1.0                                                                                                                                                                                                                                      |                    |

| Relation with other Modules       |                                     |          |   |
|-----------------------------------|-------------------------------------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |                                     |          |   |
| Prerequisite module               | Electrical Engineering Fundamentals | Semester | 1 |
| Co-requisites module              | None                                | Semester |   |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>26. To develop problem solving skills and understanding of circuit theory through the application of techniques Alternating Waveforms (A.C).</p> <p>27. To understand voltage, current and power from a (A.C) circuit.</p> <p>28. Deals with the basic concept of electrical (A.C) circuits.</p> <p>29. This is the basic subject for all electrical and electronic circuits.</p> <p>30. To understand Kirchhoff's current and voltage Laws problems.</p> <p>31. To perform Thevenin's Norton's Theorem.</p>                                                                                                                                                                                                                                                                                                                                                        |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>49. Recognize how electricity works in electrical circuits.</p> <p>50. List the various terms associated with electrical circuits.</p> <p>51. Summarize what is meant by a basic electric circuit.</p> <p>52. Discuss the reaction and involvement of atoms in electric circuits.</p> <p>53. Describe electrical power, charge, and current.</p> <p>54. Define Ohm's law.</p> <p>55. Identify the basic circuit elements and their applications.</p> <p>56. Discuss the operations of AC circuits in an electric circuit.</p> <p>57. Discuss the various properties of resistors.</p> <p>58. Explain the two Kirchhoff's laws used in circuit analysis.</p> <p>59. Identify the basic circuit elements, Maximum Power Transfer Theorem and Superposition's method</p> <p>60. Describe Thevenin's theorem and Norton's theorem and how they work IN AC Circuits.</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><u>Definition:</u> -</p> <p>The Alternating Current Network Types of Alternating Waveforms, Generation of Alternating Current, and Definitions related to Alternating Waveforms</p> <p>The Alternating Current Network.</p> <p>Ohms law, The Mean Values, The Effective Values, The Vector Diagram <b>(40 hr)</b></p> <p><u>Circuit Theory in (A.C)</u></p> <p>Ac circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction,</p>                                                                                                                                                                                                                     |

|  |                                                                                                                                                                                                                                                                                                                                                                              |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Series Ac Circuits (R L C), Reviews for Complex Numbers and their mathematical operations <b>(24 hr)</b></p> <p><u>Fundamentals</u></p> <p>Resistive networks, voltage and current sources, Thevenin and Norton equivalent circuits, Conversion Delta To Star Connection, Superposition Method, Maximum Power Transfer Theorem, Superposition's method <b>(24 hr)</b></p> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>This Course Specification prepares the student to be able to realize basic parameters in electrical engineering and how to link these parameters. It also makes him capable of solving electrical circuits using different theorems in addition to utilizing the dc theorems to solve ac circuits. Moreover, it goes into configuring 3 phase circuits, vectors, phase and total powers and to have the student being capable of linking electricity to magnetism</p> |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب                          |     |                                                                            |       |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|-------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.733 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |       |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                |            |                           |
|---------------------------------------------------|------------------------|-------------|----------------|------------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks) | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 1           | 5% (5)         | 8          | LO #1-4                   |
|                                                   | <b>Assignments</b>     | 1           | 5% (5)         | 14         | LO # 1- 11                |
|                                                   | <b>Projects / Lab.</b> | 10          | 20% (10)       | Continuous |                           |
|                                                   | <b>Report</b>          | 10          | 10% (10)       | 12         | LO # 1-12                 |
| <b>Summative</b>                                  | <b>Midterm Exam</b>    | 2 hr        | 10% (10)       | 8          | LO # 1-9                  |

|                  |            |     |                  |    |     |
|------------------|------------|-----|------------------|----|-----|
| assessment       | Final Exam | 4hr | 50% (50)         | 16 | All |
| Total assessment |            |     | 100% (100 Marks) |    |     |

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|         | Material Covered                                                                                                                                    |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1  | The Alternating Current Network Types of Alternating Waveforms, Generation of Alternating Current, and Definitions related to Alternating Waveforms |
| Week 2  | The Mean Values of Current and Voltage                                                                                                              |
| Week 3  | The Effective Vales of Current and Voltage                                                                                                          |
| Week 4  | Circuit Elements in the Phasor Domain                                                                                                               |
| Week 5  | The Vector Diagram                                                                                                                                  |
| Week 6  | Reviews for Complex Numbers and there mathematical operations                                                                                       |
| Week 7  | Series Ac Circuits (R L C) ,Parallel Ac Circuits(R L C)                                                                                             |
| Week 8  | Mid exam                                                                                                                                            |
| Week 9  | The Instantaneous Power and Mean Power of AC, Reactive and Apparent Power                                                                           |
| Week 10 | Using Kirchhoff's law's to solve AC circuits                                                                                                        |
| Week 11 | Using Superposition's method to solve AC circuits                                                                                                   |
| Week 12 | Using Thevenin's theorem, to solve AC circuits                                                                                                      |
| Week 13 | Using Norton's theorem to solve AC circuits                                                                                                         |
| Week 14 | 3- Phase Current, 3- Phase System, Y- Connection Delta Connection.                                                                                  |
| Week 15 | Transformers , The hysteresis losses , The eddy current losses                                                                                      |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|        | Material Covered                                                                                   |
|--------|----------------------------------------------------------------------------------------------------|
| Week 1 | Lab 1: How to use measuring devices for alternating circuits (A.C) Osilcope, voltmeter and ammeter |
| Week 2 | Lab 2: how to measure Alternating Waveforms                                                        |
| Week 3 | Lab 3: Apply Ohm's Law                                                                             |
| Week 4 | Lab 4: Series Ac Circuits (R C)                                                                    |
| Week 5 | Lab 5: Series Ac Circuits (R L)                                                                    |
| Week 6 | Lab 6: Series Ac Circuits (R L C)                                                                  |



|                                 |                                                                                                                                                                                               |                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Week 7                          | Lab 7: Apply Kirchhoff's law to measure voltages                                                                                                                                              |                           |
| Week 8                          | Lab 8: Apply Kirchhoff's law to measure current                                                                                                                                               |                           |
| Learning and Teaching Resources |                                                                                                                                                                                               |                           |
| مصادر التعلم والتدريس           |                                                                                                                                                                                               |                           |
|                                 | Text                                                                                                                                                                                          | Available in the Library? |
| Required Texts                  | Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education                                                                                                     | Yes                       |
| Recommended Texts               | DC Electrical Circuit Analysis: A Practical Approach<br>Copyright Year: 2020, dissidents.                                                                                                     | No                        |
| Websites                        | <a href="https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering">https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering</a> |                           |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b>                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                         |                      |                                                                                                                                                                                                                                          |                            |
|------------------------------------|-------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| معلومات المادة الدراسية            |                         |                      |                                                                                                                                                                                                                                          |                            |
| Module Title                       | Programming Essentials  |                      | Module Delivery                                                                                                                                                                                                                          |                            |
| Module Type                        | Core                    |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                            |
| Module Code                        | CET1203                 |                      |                                                                                                                                                                                                                                          |                            |
| ECTS Credits                       | 6                       |                      |                                                                                                                                                                                                                                          |                            |
| SWL (hr/sem)                       | 150                     |                      |                                                                                                                                                                                                                                          |                            |
| Module Level                       | 1                       | Semester of Delivery |                                                                                                                                                                                                                                          | 2                          |
| Administering Department           | CET                     | College              | EETC                                                                                                                                                                                                                                     |                            |
| Module Leader                      | Ali Abdulhussein yahya  |                      | e-mail                                                                                                                                                                                                                                   | ali.aljanabi@altuff.edu.iq |
| Module Leader's Acad. Title        | Asst. Lecturer          |                      | Module Leader's Qualification                                                                                                                                                                                                            | MSc                        |
| Module Tutor                       |                         |                      | e-mail                                                                                                                                                                                                                                   |                            |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein |                      | e-mail                                                                                                                                                                                                                                   | osama.abbas@mtu.edu.iq     |
| Scientific Committee Approval Date | 29/10/2023              |                      | Version Number                                                                                                                                                                                                                           | 1.0                        |

| Relation with other Modules       |      |  |          |  |
|-----------------------------------|------|--|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |  |          |  |
| Prerequisite module               | None |  | Semester |  |
| Co-requisites module              | None |  | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>1. To develop problem solving skills and understanding of programming principles.</li> <li>2. To understand the logic behind programming.</li> <li>3. This course include using C++ as a programming language.</li> <li>4. This course include algorithm design.</li> <li>5. To understand how a programmer should prepare his work and think logically.</li> <li>6. To perform programming project using control statements, functions, and to deal with the data stored in an array or file.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Use of algorithms (Flowchart specifically).</li> <li>2. Explain how the program is written using C++ Programming language.</li> <li>3. Define and use of variables (Data types, Declaration of variables).</li> <li>4. Use of operators and its precedence (Assignment, Arithmetic operators, Relational and Logical operators, Bitwise Operators, Increment and decrement, Cast operator, and Conditional operator).</li> <li>5. Making Decisions (use of: if, if-else, and switch statements) and draw of Flowchart of if-else statement.</li> <li>6. Use of Loops (for, while, do-while), and use of break and continue statements with loops, and draw of Flowchart of loops.</li> <li>7. Use of Arrays (one and two dimensional).</li> <li>8. Use of Functions (Built-in function functions (Library functions), and User-Defined functions).</li> <li>9. Use of arguments passed by value and by reference, and use of Local and global variables.</li> <li>10. Use of Character sequences and string handling.</li> <li>11. Handling and processing text files in C++.</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p>- Introduction to computers and programming. Types of programs (Applications and Systems). Programming languages (Machine, Assembly, and High-level language). Introduction to Compilers, Interpreters, object file, and executable file. Introduction to C++ with a simple program implementation. Types of programming errors, Program development life cycle, Algorithms - Flowchart - .</p> <p>Header files, Standard Input/output instructions, Comments in C++. <b>[15 hrs]</b></p> <p>-- Variables, Data Types, Declaration of variables, Constants, Statements. Operators (Assignment, Arithmetic operators, Relational and Logical operators,</p>                                                                                                                                                                                                                                                                                                                                                                                                                    |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Bitwise Operators, Increment and decrement, Cast operator, and Conditional operator), Precedence of operators. <b>[5 hrs]</b></p> <p>-- Making Decisions (if, if-else statements), Flowchart of if-else statement. Making Decisions (switch statement), using break statement with switch statement, Flowchart of switch statement. Loops (for, while, do-while), using break and continue statements with loops, Flowchart of loops. <b>[10 hrs]</b></p> <p>- -Arrays (One dimensional and Two Dimensional) <b>[5 hrs]</b></p> <p>-- Functions (Built-in function functions (Library functions), and User-Defined functions), Function prototype (Declaration), Function call, Passing arguments to a function, return statement, Value-Returning vs. Void (Non Value Returning) functions, Function with no argument and no return value, Function with no argument but return value, Function with argument but no return value, Function with argument and return value. Arguments passed by value and by reference, Recursion, Local and global variables. <b>[15 hrs]</b></p> <p>-- Character sequences and string handling, ASCII table. <b>[5 hrs]</b></p> <p>- -Handling and processing text files in C++ <b>[5 hrs]</b></p> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in learning and developing their skills in programming and logic thinking, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of lab experiments involving assignments and project design activities that are interesting to the students.</p> |

| Student Workload (SWL)<br>الحمل الدراسي للطالب                                 |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.73 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |      |

| Module Evaluation<br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|--------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                            |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                       | Quizzes         | 1           | 10% (10)         | 6          | LO #1- 6                  |
|                                            | Assignments     | 1           | 10% (10)         | Continuous | LO #1-10                  |
|                                            | Projects / Lab. | 1           | 10% (10)         | Continuous | LO #1-11                  |
|                                            | Report          | 1           | 5% (10)          | Continuous | LO #1, 11                 |
| Summative assessment                       | Midterm Exam    | 2 hr        | 10% (10)         | 7          | LO # 1 to 7               |
|                                            | Final Exam      | 4hr         | 50% (50)         | 15         | All                       |
| Total assessment                           |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus)<br>المنهاج الأسبوعي النظري |                                                                                                                                                        |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | Material Covered                                                                                                                                       |
| <b>Week 1</b>                                              | Introduction (History of computers). Types of programs (Applications and Systems). Programming languages (Machine, Assembly, and High-level language). |
| <b>Week 2</b>                                              | Introduction to Compilers, Interpreters, object file, and executable file. Types of programming errors, program development life cycle.                |
| <b>Week 3</b>                                              | Algorithms (Flowchart).                                                                                                                                |
| <b>Week 4</b>                                              | Variables, Data Types, Declaration of variables, Constants, Statements, and Operators.                                                                 |
| <b>Week 5</b>                                              | Making Decisions (if, if-else statements), flowchart of if-else statement.                                                                             |
| <b>Week 6</b>                                              | Making Decisions (switch statement), using break statement with switch statement, flowchart of switch statement.                                       |

|                |                                                                                                                                                                                                                                                                                                            |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 7</b>  | Mid-term Exam                                                                                                                                                                                                                                                                                              |
| <b>Week 8</b>  | Loops (while, do-while), using break and continue statements with loops, flowchart of loops.                                                                                                                                                                                                               |
| <b>Week 9</b>  | Arrays (One dimensional)                                                                                                                                                                                                                                                                                   |
| <b>Week 10</b> | Arrays (Two Dimensional)                                                                                                                                                                                                                                                                                   |
| <b>Week 11</b> | Functions: Built-in function functions (Library functions), and User-Defined functions),<br>Function prototype (Declaration), function call, Passing arguments to a function, return statement,<br>Local and global variables.                                                                             |
| <b>Week 12</b> | Functions (Value-Returning) vs. Void (Non Value Returning) functions, function with no argument<br>and no return value, function with no argument but return value, function with argument but no<br>return value, function with argument and return value.<br>Arguments passed by value and by reference. |
| <b>Week 13</b> | Character sequences and string handling, ASCII table.                                                                                                                                                                                                                                                      |
| <b>Week 14</b> | Handling and processing text files in C++                                                                                                                                                                                                                                                                  |
| <b>Week 15</b> | <b>Preparatory week before the final Exam</b>                                                                                                                                                                                                                                                              |

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الأسبوعي للمختبر

|                | Material Covered                                                                                                                                                                                                   |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Lab 1: Introduction to C++ with a simple program implementation. Header files, Standard Input/output instructions, Comments in C++.                                                                                |
| <b>Week 2</b>  | Lab 2: Variables and Operators (Assignment, Arithmetic operators, Relational and Logical operators, Bitwise Operators, Increment and decrement, Cast operator, and Conditional operator), Precedence of operators. |
| <b>Week 3</b>  | Lab 3: Making Decisions (if, if-else).                                                                                                                                                                             |
| <b>Week 4</b>  | Lab 4: Making Decisions (switch statements).                                                                                                                                                                       |
| <b>Week 5</b>  | Lab 5: Loops (for)                                                                                                                                                                                                 |
| <b>Week 6</b>  | Lab 6: Loops (while, and do-while)                                                                                                                                                                                 |
| <b>Week 7</b>  | Lab 7: Arrays (1D)                                                                                                                                                                                                 |
| <b>Week 8</b>  | Lab 8: Arrays (2D)                                                                                                                                                                                                 |
| <b>Week 9</b>  | Lab 9: Functions                                                                                                                                                                                                   |
| <b>Week 10</b> | Lab 10: Function types according to whether it take arguments and/or return a value or not.                                                                                                                        |
| <b>Week 11</b> | Lab 11: Character sequences and string handling.                                                                                                                                                                   |
| <b>Week 12</b> | Lab 12: Text files                                                                                                                                                                                                 |

| Learning and Teaching Resources |                                                                                                                               |                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                               |                           |
|                                 | Text                                                                                                                          | Available in the Library? |
| Required Texts                  | C++ How to Program, 6th Edition 2007<br>By P. J. Deitel - Deitel & Associates, Inc., H. M. Deitel - Deitel & Associates, Inc. | Yes                       |
| Recommended Texts               | Starting Out with Programming Logic and Design (What's New in Computer Science), 5th Edition 2018<br>By Tony Gaddis           | No                        |
| Websites                        | <a href="https://www.geeksforgeeks.org/c-plus-plus">https://www.geeksforgeeks.org/c-plus-plus</a>                             |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                      |                               |                                                                                                                                                                                                                                          |
|------------------------------------|--------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                      |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Mathematics II                       |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Support or related learning activity |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET1204                              |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                    |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                                  |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 1                                    | Semester of Delivery          | 2                                                                                                                                                                                                                                        |
| Administering Department           | CET                                  | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Zinah Hayder Hammodi Alhussein       |                               | e-mail: zinah.alhusseini@altuff.edu.iq                                                                                                                                                                                                   |
| Module Leader's Acad. Title        | Assistant Lecturer                   | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                                    |
| Module Tutor                       |                                      |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Assist prof.<br>Alhamzah Taher       | e-mail                        | alhamza_tm@yahoo.com                                                                                                                                                                                                                     |
| Scientific Committee Approval Date | 29/10/2023                           | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |          |          |   |
|-----------------------------------|----------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |          |          |   |
| Prerequisite module               | CET 1103 | Semester | 1 |
| Co-requisites module              | None     | Semester |   |



| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br><b>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><b>أهداف المادة الدراسية</b>                                                                               | 7. To Understand concepts of vectors and vector operations.<br>8. To Understand concepts of linear algebra.<br>9. To get a grasp of various methods to solve systems of linear equations.<br>10. To Compute linear transformations.<br>11. To be able to determine Eigenvalues and Eigenvectors.<br>12. To perform matrix diagonalization.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | 16. Recognize Vectors concepts, notation and Operations.<br>17. Discuss dot product, cross product, Orthogonal and orthonormal vectors.<br>18. Discuss the terms Diagonal, Triangular, Symmetric, Square Matrix, Transpose of a Matrix.<br>19. Describe the matrix operations {addition, subtraction, scalar multiplication, multiplication}.<br>20. Identify Determinant and Inverse for Nonsingular matrices.<br>21. Discuss aspects about System of Linear Equations (Linear Equations, Linear Equations Solution, Matrix equations.).<br>22. Identify Row operations, row-echelon form "triangular", Rank of a Matrix, reduced row-echelon form, Augmented Matrix.<br>23. Discuss Gaussian elimination.<br>24. Explain Gauss–Jordan elimination and Solving Systems with Inverses.<br>25. Explain Cramer's Rule.<br>26. Explain Linear Combinations of Vector, span.<br>27. Explain Linear Dependence and Independence, Basis and Dimension, Rank of a Matrix.<br>28. Recognize Linear Transformations.<br>29. Discuss Polynomials of Matrices, Characteristic Polynomial, Cayley–Hamilton Theorem.<br>30. Discuss Eigenvalues and Eigenvectors, Diagonalizing Matrices. |
| <b>Indicative Contents</b><br><b>المحتويات الإرشادية</b>                                                                         | <u>Part A - Vectors.</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>This part includes Vectors definition, notation {Ordered set, Matrix, Unit vector}, Magnitude, Unit, Zero, negative, Direction, Operations on vectors {addition, subtraction, scalar multiplication}. In addition to Operations on vectors {dot product, cross product}, Orthogonal, orthonormal vectors. <b>[6 hrs]</b> + Revision problem classes in weekly tutorials <b>[2 hrs]</b></p> <p><u>Part B – Matrices.</u></p> <p>This part will take in details Matrices (Matrix, Diagonal, Triangular, Symmetric, Square Matrix, Transpose of a Matrix.), in addition to operations {addition, subtraction, scalar multiplication, multiplication}. Furthermore, Determinant, Inverse (Nonsingular). <b>[10 hrs]</b> + Revision problem classes in weekly tutorials <b>[3 hrs]</b></p> <p><u>Part C – System of Linear Equations.</u></p> <p>This part discusses System of Linear Equations (Linear Equations, Linear Equations Solution, Matrix equations.), in addition to Row operations, row-echelon form “triangular”, Rank of a Matrix, reduced row-echelon form, Augmented Matrix. Furthermore, Gaussian elimination, Gauss–Jordan elimination, Solving Systems with Inverses, Cramer's Rule is described. <b>[14 hrs]</b> + Revision problem classes in weekly tutorials <b>[4 hrs]</b></p> <p><u>Part D – Vector Spaces and Diagonalization.</u></p> <p>This part discusses Vector Spaces (Linear Combinations of Vector, span, Linear Dependence and Independence, Basis and Dimension, Rank of a Matrix, Linear Transformations. Furthermore, Diagonalization (Polynomials of Matrices, Characteristic Polynomial, Cayley–Hamilton Theorem, Eigenvalues and Eigenvectors, Diagonalizing Matrices.) <b>[15 hrs]</b> + Revision problem classes in weekly tutorials <b>[5 hrs]</b></p> |
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## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                              |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>This module will primarily focus on encouraging students to participate in the activities, as well as refining and developing their critical thinking skills. This will be achieved through lectures, tutorials, discussions, and grading activities.</p> |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب

|                                                                                |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 48  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 3.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 77  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 5.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 125 |                                                                           |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                  |          |                           |
|---------------------------------------------------|------------------------|-------------|------------------|----------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2           | 20%              | 5,10     | LO #1 - 4, LO # 6-9       |
|                                                   | <b>Assignments</b>     | 2           | 15%              | 5,10     | LO # 1 - 14, LO # 6-9     |
|                                                   | <b>Projects / Lab.</b> | N/A         |                  |          |                           |
|                                                   | <b>Report</b>          | 5           | 5%               | Cont.    | LO # 1-15                 |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 5        | LO # 1-7                  |
|                                                   | <b>Final Exam</b>      | 3hr         | 50% (50)         | 16       | All                       |
| <b>Total assessment</b>                           |                        |             | 100% (100 Marks) |          |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                                                                             |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                                                                                     |
| <b>Week 1</b>                                                     | <b>Vectors</b> (Definition, notation {Ordered set, Matrix, Unit vector}, Magnitude, Unit, Zero, negative, Direction, Operations on vectors {addition, subtraction, scalar multiplication}.) |
| <b>Week 2</b>                                                     | <b>Vectors</b> (Operations on vectors {dot product, cross product}, Orthogonal, orthonormal vectors.)                                                                                       |

|                |                                                                                                                                                  |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 3</b>  | <b>Matrices (Matrix, Diagonal, Triangular, Symmetric, Square Matrix, Transpose of a Matrix.)</b>                                                 |
| <b>Week 4</b>  | <b>Matrices (operations {addition, subtraction, scalar multiplication, multiplication}). Matrices (Determinant, Inverse (Nonsingular))</b>       |
| <b>Week 5</b>  | <b>Midterm Exam</b>                                                                                                                              |
| <b>Week 6</b>  | <b>System of Linear Equations (Linear Equations, Linear Equations Solution, Matrix equations.)</b>                                               |
| <b>Week 7</b>  | <b>System of Linear Equations (Row operations, row-echelon form “triangular”, Rank of a Matrix, reduced row-echelon form, Augmented Matrix.)</b> |
| <b>Week 8</b>  | <b>System of Linear Equations (Gaussian elimination.), System of Linear Equations (Gauss–Jordan elimination, Solving Systems with Inverses.)</b> |
| <b>Week 9</b>  | <b>System of Linear Equations (Cramer's Rule.)</b>                                                                                               |
| <b>Week 10</b> | <b>Midterm Exam</b>                                                                                                                              |
| <b>Week 11</b> | <b>Vector Spaces (Linear Combinations of Vector, span.). Vector Spaces (Linear Transformations.)</b>                                             |
| <b>Week 12</b> | <b>Midterm Exam</b>                                                                                                                              |
| <b>Week 13</b> | <b>Vector Spaces (Linear Dependence and Independence, Basis and Dimension, Rank of a Matrix.)</b>                                                |
| <b>Week 14</b> | <b>Diagonalization (Polynomials of Matrices, Characteristic Polynomial, Cayley–Hamilton Theorem.)</b>                                            |
| <b>Week 15</b> | <b>Diagonalization (Eigenvalues and Eigenvectors, Diagonalizing Matrices.)</b>                                                                   |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                    |

### Delivery Plan (Weekly Tutorial)

| المنهاج الاسبوعي الاضافي                                                                                             |                         |
|----------------------------------------------------------------------------------------------------------------------|-------------------------|
|                                                                                                                      | <b>Material Covered</b> |
| Each week, a question sheet related to the material presented in the theoretical lecture will be solved and debated. |                         |

| Learning and Teaching Resources |                                                                                                                                                                  |                           |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                  |                           |
|                                 | Text                                                                                                                                                             | Available in the Library? |
| <b>Required Texts</b>           | David C. Lay, Judi J. McDonald, Steven R. Lay, "Linear Algebra and Its Applications", Pearson Education, 6th edition (July 10th 2020), ISBN-13: 978- 0136880929. | Yes                       |
| <b>Recommended Texts</b>        | Gilbert Strang, " Linear Algebra and Its Applications", Cengage Learning, 4th edition, (January 1, 2006), ISBN-13: 978-0030105678.                               | No                        |
| <b>Websites</b>                 | <a href="https://www.udemy.com/course/linear-algebra-with-applications/">https://www.udemy.com/course/linear-algebra-with-applications/</a>                      |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b><br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                   | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                        | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                           |                      |                                                                                                                                                                                                                               |                        |
|------------------------------------|---------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| معلومات المادة الدراسية            |                           |                      |                                                                                                                                                                                                                               |                        |
| Module Title                       | Arabic Language I         |                      | Module Delivery                                                                                                                                                                                                               |                        |
| Module Type                        | Basic learning activities |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                        |
| Module Code                        | MTU1001                   |                      |                                                                                                                                                                                                                               |                        |
| ECTS Credits                       | 2                         |                      |                                                                                                                                                                                                                               |                        |
| SWL (hr/sem)                       | 50                        |                      |                                                                                                                                                                                                                               |                        |
| Module Level                       | 1                         | Semester of Delivery |                                                                                                                                                                                                                               | 2                      |
| Administering Department           | CET                       | College              | EETC                                                                                                                                                                                                                          |                        |
| Module Leader                      | Dr. Salim Hashim          |                      | e-mail                                                                                                                                                                                                                        | dr.salim@altuff.edu.iq |
| Module Leader's Acad. Title        | Assistant Lecturer        |                      | Module Leader's Qualification                                                                                                                                                                                                 | M.Sc                   |
| Module Tutor                       |                           |                      | e-mail                                                                                                                                                                                                                        |                        |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein   |                      | e-mail                                                                                                                                                                                                                        | osama.abbas@mtu.edu.iq |
| Scientific Committee Approval Date | 29/10/2023                | Version Number       | 1.0                                                                                                                                                                                                                           |                        |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>أهداف المادة الدراسية هي اني يكون الطالب قادراً على أن :</p> <ol style="list-style-type: none"> <li>1. يتعرف على أنواع الأخطاء اللغوية المشتركة وتوضيح أسبابها وكيفية تجنبها.</li> <li>2. يتعلم القواعد المتعلقة بالتاء المربوطة والطويلة والتاء المفتوحة وكيفية كتابتها بشكل صحيح.</li> <li>3. يتعلم قواعد كتابة الألف الممدودة والمقصورة واستخدام الحروف الشمسية والقمرية بشكل صحيح.</li> <li>4. التعرف على الضاد والظاء ومعرفة كيفية التمييز بينهما في الكتابة.</li> <li>5. يتعلم طرق كتابة الهمزة بشكل صحيح وفقاً للقواعد اللغوية.</li> <li>6. التعرف على علامات الترقيم واستخدامها بشكل صحيح في النصوص.</li> <li>7. يفهم الفروق بين الاسم والفعل والتمييز بينهما في الجمل.</li> <li>8. يفهم المفاعيل وكيفية استخدامها بشكل صحيح في النصوص.</li> <li>9. يتعلم الأرقام والعدد واستخدامها في التعبير عن الكميات.</li> <li>10. يتجنب الأخطاء اللغوية الشائعة في سياقات عملية لتعزيز فهم القواعد وتحسين المهارات اللغوية.</li> <li>11. يدرس النون والتنوين وفهم معاني حروف الجر واستخدامها بشكل صحيح في الجمل.</li> <li>12. يركز على الجوانب الشكلية للخطاب الإداري وكيفية كتابته بأسلوب صحيح ومناسب.</li> <li>13. التعرف على لغة الخطاب الإداري وفهم استخدامها في التواصل الإداري.</li> <li>14. يفهم نماذج من المراسلات الإدارية لتطبيق المفاهيم والمهارات المكتسبة في الخطاب الإداري.</li> </ol> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>مخرجات التعلم للمادة الدراسية هي:</p> <ol style="list-style-type: none"> <li>1. قدرة الطلاب على تحليل وتعريف الأخطاء اللغوية المشتركة وتطبيق القواعد الصحيحة لتجنبها.</li> <li>2. القدرة على استخدام القواعد اللغوية المتعلقة بالتاء المربوطة والطويلة والتاء المفتوحة بشكل صحيح.</li> <li>3. قدرة الطلاب على استخدام الألف الممدودة والمقصورة بشكل صحيح واستخدام الحروف الشمسية والقمرية بطريقة صحيحة.</li> <li>4. تمكين الطلاب من التمييز بين الضاد والظاء وتطبيق القواعد الصحيحة في الكتابة.</li> <li>5. القدرة على كتابة الهمزة بشكل صحيح وفقاً للقواعد اللغوية.</li> <li>6. استخدام علامات الترقيم بشكل صحيح في النصوص المكتوبة.</li> <li>7. فهم الطلاب للفروق بين الاسم والفعل وتمكينهم من استخدامها بشكل صحيح في الجمل.</li> <li>8. القدرة على استخدام المفاعيل بشكل صحيح في النصوص المكتوبة.</li> <li>9. استخدام الأرقام والعدد بطريقة صحيحة للتعبير عن الكميات.</li> <li>10. التمكن من تطبيق الأخطاء اللغوية الشائعة في سياقات عملية وتصحيحها بشكل مناسب.</li> <li>11. فهم استخدام النون والتنوين ومعاني حروف الجر واستخدامها بشكل صحيح في الجمل.</li> <li>12. القدرة على كتابة الخطاب الإداري بأسلوب صحيح ومناسب وفهم لغة الخطاب الإداري.</li> <li>13. تطبيق المفاهيم والمهارات المكتسبة في كتابة المراسلات الإدارية بشكل صحيح وفعال.</li> </ol>                                         |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>المحتويات الإرشادية في مادة اللغة تشمل مجموعة من المفاهيم والمواضيع التي يتم تغطيتها خلال عملية التعلم. ومن بين المحتويات الإرشادية المهمة:</p> <ol style="list-style-type: none"> <li>1. مقدمة عن الأخطاء اللغوية والتعريف بالتاء المربوطة والتاء المطولة والتاء المفتوحة. ( 4 ساعات)</li> <li>2. قواعد كتابة الألف الممدودة والمقصورة والتعرف على الحروف الشمسية والقمرية. ( 4 ساعات)</li> <li>3. دراسة الضاد والظاء وتعلم طرق كتابتهما بشكل صحيح. ( 4 ساعات)</li> <li>4. تعلم كتابة الهمزة بشكل صحيح وفقاً للقواعد اللغوية. ( 4 ساعات)</li> <li>5. دراسة علامات الترقيم وتعلم استخدامها بشكل صحيح في النصوص اللغوية. ( 4 ساعات)</li> <li>6. التعرف على الاسم والفعل والتفريق بينهما وفهم القواعد المتعلقة بهما. ( 4 ساعات)</li> <li>7. دراسة المفاعيل وتعلم استخدامها في الجمل اللغوية. ( 4 ساعات)</li> <li>8. التعرف على الأعداد واستخدامها بشكل صحيح في العبارات والجمل. ( 4 ساعات)</li> <li>9. دراسة الأخطاء اللغوية الشائعة وتطبيقاتها في النصوص اللغوية. ( 4 ساعات)</li> <li>10. تعلم استخدام النون والتنوين وفهم معاني حروف الجر واستخدامها بشكل صحيح في الجمل. ( 3 ساعات)</li> <li>11. التعرف على الجوانب الشكلية للخطاب الإداري وفهم لغته وقواعده. ( 3 ساعات)</li> <li>12. دراسة نماذج من المراسلات الإدارية وتطبيقها في الكتابة. ( 3 ساعات)</li> </ol>                                 |

|                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                               | توفر هذه المحتويات الإرشادية للطلاب فهماً شاملاً للمفاهيم اللغوية وتعلم القواعد والتطبيقات العملية التي تساعدهم في تطوير مهاراتهم اللغوية.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Strategies</b>                                                             | <p>استراتيجيات التعلم والتعليم المستخدمة في مادة اللغة تشمل مجموعة متنوعة من النهج والتقنيات التي تعزز عملية التعلم للطلاب. من بين هذه الاستراتيجيات:</p> <ol style="list-style-type: none"> <li>1. التفاعل النشط: يتم تشجيع الطلاب على المشاركة والمشاركة الفعالة في الدروس من خلال المناقشات الجماعية والأنشطة التفاعلية.</li> <li>2. التعلم التعاوني: يشجع التعاون والتعاون بين الطلاب من خلال العمل الجماعي والمشاريع الجماعية، حيث يتعاون الطلاب مع بعضهم البعض لتحقيق أهداف التعلم المحددة.</li> <li>3. التطبيق العملي: يتم توفير فرص للطلاب لتطبيق المفاهيم والمهارات المكتسبة في سياقات عملية وواقعية، مما يعزز التفاعل الفعال مع المادة.</li> <li>4. استخدام التقنيات الحديثة: يستفيد الطلاب من استخدام التكنولوجيا في عملية التعلم، مثل استخدام الحواسيب والإنترنت للبحث والتعلم الذاتي.</li> <li>5. توفير ردود فعل فورية: يتم توفير ردود فعل فورية وتقييم مستمر للطلاب، سواء عن طريق التقييمات الشفهية أو الكتابية، مما يساعدهم على تحسين أدائهم وتطوير مهاراتهم.</li> <li>6. التنوع في وسائل التواصل: يتم استخدام مجموعة متنوعة من وسائل التواصل والتعليم، مثل المحاضرات التوضيحية، والمناقشات الجماعية، والأنشطة العملية، والعروض التقديمية، لتلبية احتياجات وأساليب التعلم المختلفة للطلاب.</li> <li>7. باستخدام هذه الاستراتيجيات، يتم تعزيز التفاعل والتعلم الفعال للطلاب، و</li> <li>8. تحفيزهم على المشاركة واكتساب المعرفة والمهارات بشكل شامل وشيق.</li> </ol> |

|                                                                                  |    |                                                                            |      |
|----------------------------------------------------------------------------------|----|----------------------------------------------------------------------------|------|
| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعاً</b> |    |                                                                            |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل         | 33 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعياً       | 2.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل   | 17 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعياً | 1.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل                | 50 |                                                                            |      |

|                                                          |                    |                       |                 |                                  |
|----------------------------------------------------------|--------------------|-----------------------|-----------------|----------------------------------|
| <b>Module Evaluation</b><br><b>تقييم المادة الدراسية</b> |                    |                       |                 |                                  |
|                                                          | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |



|                      |                        |         |                  |       |                 |
|----------------------|------------------------|---------|------------------|-------|-----------------|
| Formative assessment | Quizzes                | 2       | 20%              | 5, 10 | LO #1-4 LO #4-9 |
|                      | Assignments            | 2       | 10% (10)         | 2, 12 | LO # 1-5 , 5-12 |
|                      | Projects / <b>Lab.</b> |         |                  |       |                 |
|                      | Report                 | 1       | 10% (10)         | 14    | LO # 1-12       |
| Summative assessment | Midterm Exam           | 2 hours | 20% (10)         | 7     | LO # 1-7        |
|                      | Final Exam             | 3 hours | 50% (50)         | 16    | All             |
| Total assessment     |                        |         | 100% (100 Marks) |       |                 |

| Delivery Plan (Weekly Syllabus) |                                                                    |                                |
|---------------------------------|--------------------------------------------------------------------|--------------------------------|
| المنهاج الاسبوعي النظري         |                                                                    |                                |
| 8-1                             | مقدمة عن الأخطاء اللغوية – التاء المربوطة والطويلة والتاء المفتوحة | الأسبوع الأول                  |
| 14-9                            | قواعد كتابة الالف الممدودة والمقصورة – الحروف الشمسية والقمرية     | الأسبوع الثاني                 |
| 19-15                           | الضاد والظاء                                                       | الاسبوع الثالث                 |
| 30-20                           | كتابة الهمزة                                                       | الأسبوع الرابع                 |
| 36-31                           | علامات الترقيم                                                     | الأسبوع الخامس                 |
| 50-37                           | الاسم والفعل والتفريق بينهما - المفاعيل                            | الأسبوع السادس                 |
|                                 | الامتحان النصفى                                                    | الأسبوع السابع                 |
| 61-51                           | العدد                                                              | الأسبوع الثامن                 |
| 69-62                           | تطبيقات الأخطاء اللغوية الشائعة                                    | الأسبوع التاسع والعاشر         |
| 75-70                           | النون والتنوين - معاني حروف الجر                                   | الاسبوع الحادي عشر             |
| 80-76                           | الجوانب الشكلية للخطاب الإداري                                     | الاسبوع الثاني عشر             |
| 86-81                           | لغة الخطاب الإداري                                                 | الأسبوع الثالث عشر والرابع عشر |
|                                 | نماذج من المراسلات الإدارية                                        | الأسبوع الخامس عشر             |
|                                 | الاستعداد للامتحان النهائي                                         | الأسبوع السادس عشر             |

| Learning and Teaching Resources |                                                                      |                           |
|---------------------------------|----------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                      |                           |
|                                 | Text                                                                 | Available in the Library? |
| Required Texts                  | ملزمة اللغة العربية ( المعجمة من وزارة التعليم العالي والبحث العلمى) | Yes                       |
| Recommended Texts               |                                                                      | No                        |
| Websites                        | The Collage E-Library                                                |                           |

| Grading Scheme |
|----------------|
| مخطط الدرجات   |

| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group (50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                      | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group (0 - 49)</b>                                                                                                                                                                                                                                                                                                                                                           | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                           |                               |                                                                                                                                                                                                                               |
|------------------------------------|-------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                           |                               |                                                                                                                                                                                                                               |
| Module Title                       | Democracy and Human Rights                |                               | Module Delivery                                                                                                                                                                                                               |
| Module Type                        | Basic learning activities                 |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | MTU1006                                   |                               |                                                                                                                                                                                                                               |
| ECTS Credits                       | 2                                         |                               |                                                                                                                                                                                                                               |
| SWL (hr/sem)                       | 50                                        |                               |                                                                                                                                                                                                                               |
| Module Level                       | 1                                         | Semester of Delivery          |                                                                                                                                                                                                                               |
| Administering Department           | CET                                       | College                       | EETC                                                                                                                                                                                                                          |
| Module Leader                      | Khudair Safi                              |                               | e-mail                                                                                                                                                                                                                        |
| Module Leader's Acad. Title        | Asst Lecturer                             | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                         |
| Module Tutor                       |                                           | e-mail                        |                                                                                                                                                                                                                               |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                         |
| Scientific Committee Approval Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                           |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>1. التطور التاريخي لحقوق الإنسان: دراسة التطور التاريخي لفهم حقوق الإنسان من الحضارات القديمة إلى العصور الحديثة.</li> <li>2. حقوق الإنسان في الشرائع السماوية: التركيز على حقوق الإنسان في الإسلام وكيف تم تضمينها في الشريعة الإسلامية.</li> <li>3. اعتراف إقليمي بحقوق الإنسان: فحص اعتراف الأقاليم الأوروبي، الأمريكي، الإفريقي، الإسلامي، والعربي بحقوق الإنسان.</li> <li>4. دور المنظمات غير الحكومية: دراسة دور المنظمات مثل اللجنة الدولية للصليب الأحمر ومنظمة العفو الدولية في حماية حقوق الإنسان.</li> <li>5. الإطار القانوني الدولي والإقليمي: التركيز على المواثيق الدولية والإقليمية، مثل الإعلان العالمي لحقوق الإنسان.</li> <li>6. تحليل حقوق الإنسان في التشريعات الوطنية: دراسة كيفية ترجمة حقوق الإنسان في التشريعات الوطنية، مع التركيز على الدستور العراقي.</li> <li>7. تصنيف حقوق الإنسان وضماناتها: فهم مختلف أشكال حقوق الإنسان والضمانات الدستورية والقضائية والسياسية لحمايتها.</li> </ol>                                                                                                                                                                                |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. القدرة على وصف وتحليل التطور التاريخي لحقوق الإنسان منذ الحضارات القديمة حتى العصور الحديثة.</li> <li>2. القدرة على فحص حقوق الإنسان في حضارة وادي الرافدين وغيرها لفهم التأثير الثقافي على تطورها.</li> <li>3. تفسير حقوق الإنسان في الإسلام وفهم كيف تم تضمينها في الشريعة الإسلامية.</li> <li>4. القدرة على تحليل تطور حقوق الإنسان خلال العصور الوسطى والحديثة.</li> <li>5. الفهم الشامل لاعتراف الأقاليم الأوروبي، الأمريكي، الإفريقي، الإسلامي، والعرب بحقوق الإنسان.</li> <li>6. القدرة على تقييم دور منظمات مثل اللجنة الدولية للصليب الأحمر ومنظمة العفو الدولية في حماية حقوق الإنسان.</li> <li>7. القدرة على دراسة وتحليل المواثيق الدولية والإقليمية، بما في ذلك الإعلان العالمي لحقوق الإنسان.</li> <li>8. القدرة على فحص كيف تم ترجمة حقوق الإنسان في التشريعات الوطنية، مع التركيز على مثال الدستور العراقي.</li> <li>9. القدرة على تصنيف حقوق الإنسان إلى أشكال فردية وجماعية، وأجيال مثل الحقوق المدنية والسياسية والاقتصادية والاجتماعية.</li> <li>10. القدرة على تحليل الضمانات الدستورية والقضائية والسياسية لحقوق الإنسان على الصعيدين الوطني والدولي والإقليمي.</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>فهم التاريخ التطوري لحقوق الإنسان (3 س)</p> <p>تحليل حقوق الإنسان في الحضارات القديمة (3 س)</p> <p>فهم حقوق الإنسان في الشرائع السماوية (3 س)</p> <p>تحليل حقوق الإنسان في العصور الوسطى والحديثة (3 س)</p> <p>فهم الاعتراف الإقليمي بحقوق الإنسان (3 س)</p> <p>تقدير دور المنظمات غير الحكومية (3 س)</p> <p>فهم الإطار القانوني لحقوق الإنسان (3 س)</p> <p>تحليل حقوق الإنسان في التشريعات الوطنية (3 س)</p> <p>فهم أشكال وأجيال حقوق الإنسان (3 س)</p> <p>تحليل ضمانات حقوق الإنسان (3 س)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strategies | <p>تشجيع الطلاب على المشاركة في مناقشات تفاعلية حول تطور حقوق الإنسان عبر التاريخ.<br/> مشروعات بحثية:<br/> توجيه الطلاب في إعداد مشروعات بحثية تستكشف تطور حقوق الإنسان في فترات تاريخية محددة.<br/> استخدام التكنولوجيا:<br/> تضمين وسائل تكنولوجيا لتعزيز تفاعل الطلاب وتقديم المعلومات بشكل أكثر تفاعلية.<br/> ورش العمل والتمثيل العملي:<br/> إجراء ورش عمل تفاعلية وأنشطة تمثيل لفهم أعمق لمفاهيم حقوق الإنسان.<br/> تقديم تقييم مستمر:<br/> تقديم تقييم مستمر لفحص تقدم الطلاب وفهمهم لتطور حقوق الإنسان على مر العصور.</p> |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

|                                                                                |    |                                                                           |      |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 33 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 2.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 17 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 1.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 50 |                                                                           |      |

## Module Evaluation

### تقييم المادة الدراسية

|                      | Time/Number     | Weight (Marks)      | Week Due | Relevant Learning Outcome |
|----------------------|-----------------|---------------------|----------|---------------------------|
| Formative assessment | Quizzes         | 2<br>10% (10)       | 5, 10    | LO #1-4 , LO #4-9         |
|                      | Assignments     | 2<br>20%            | 2, 12    | LO # 1-4, LO #1,10        |
|                      | Projects / Lab. |                     |          |                           |
|                      | Report          | 1<br>10% (10)       | 14       | LO # 1-10                 |
| Summative assessment | Midterm Exam    | 2 hours<br>20% (10) | 7        | LO # 1-7                  |
|                      | Final Exam      | 3 hours<br>50% (50) | 16       | All                       |
| Total assessment     |                 | 100% (100 Marks)    |          |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                                                                                                                     |
| الأسبوع الأول                   | التطور التاريخي لحقوق الانسان<br>حقوق الانسان في الحضارات القديمة (حضارة وادي الرافدين، والحضارات القديمة الأخرى)                                                                                                                                   |
| الأسبوع الثاني                  | حقوق الانسان في الشرائع السماوية مع التركيز على حقوق الانسان في الاسلام.<br>حقوق الانسان في العصور الوسطى والحديثة.                                                                                                                                 |
| الاسبوع الثالث                  | الاعتراف الاقليمي بحقوق الانسان على الصعيد الاوربي الامريكي، الافريقي، الإسلامي، العربي                                                                                                                                                             |
| الأسبوع الرابع                  | المنظمات غير الحكومية ودورها في حقوق الانسان اللجنة الدولية للصليب الاحمر، منظمة العفو الدولية، منظمة مراقبة حقوق الانسان المنظمة العربية لحقوق الانسان                                                                                             |
| الأسبوع الخامس                  | حقوق الانسان في المواثيق الدولية والاقليمية والتشريعات الوطنية.<br>حقوق الانسان في المواثيق الدولية (الاعلان العالمي لحقوق الانسان العهد الدولي الخاصين بحقوق الانسان)                                                                              |
| الأسبوع السادس                  | حقوق الانسان في المواثيق الاقليمية ( الاتفاقية الأوروبية لحقوق الانسان الاتفاقية الامريكية لحقوق الانسان الميثاق الافريقي لحقوق الانسان الميثاق العربي لحقوق الانسان)                                                                               |
| الأسبوع السابع                  | امتحان منتصف الفصل الدراسي                                                                                                                                                                                                                          |
| الأسبوع الثامن                  | حقوق الانسان في التشريعات الوطنية (الدستور العراقي)                                                                                                                                                                                                 |
| الأسبوع التاسع                  | اشكال واجبال حقوق الانسان:<br>اشكال حقوق الانسان الحقوق الفردية، الحقوق الجماعية اجبال حقوق الانسان الجيل الاول الحقوق المدنية والسياسية)، (الجيل الثاني الحقوق الاقتصادية والاجتماعية)، (الجيل الثالث: حقوق الانسان الحديثة ، الوعي الماني والبيتي |
| الأسبوع العاشر                  | ضمانات حقوق الانسان وحمايتها على الصعيد الوطني<br>الضمانات الدستورية والقضائية والسياسية                                                                                                                                                            |
| الاسبوع الحادي عشر              | ضمانات حقوق الإنسان وحمايتها على الصعيدين الاقليمي والدولي (دور الامم المتحدة، دور المنظمات الاقليمية جريمة الإبادة الجماعية.                                                                                                                       |
| الاسبوع الثاني عشر              | تصنيف الحريات العامة الحريات الأساسية والفردية حرية الامن والشعور بالاطمئنان حرية الذهاب والاياب، الحرية الشخصية                                                                                                                                    |
| الأسبوع الثالث عشر              | الحريات الفكرية والثقافية حرية الرأي حرية المعتقد حرية التعليم                                                                                                                                                                                      |
| الأسبوع الرابع عشر              | حرية الصحافة حرية التجمع حرية تشكيل الجمعيات                                                                                                                                                                                                        |
| الأسبوع الخامس عشر              | الحريات الاقتصادية والاجتماعية حرية العمل، حرية التملك حرية التجارة والصناعة                                                                                                                                                                        |

| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                        | Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Available in the Library? |
| <b>Required Texts</b>                                                  | <ul style="list-style-type: none"> <li>"حقوق الإنسان في العالم العربي: القضايا والتحديات"، تأليف: علي حجازي وجمال شعت. الطبعة: الطبعة الثانية، العام: 2017.</li> <li>"مبادئ حقوق الإنسان: المفاهيم والقضايا الحديثة"، تأليف: أحمد المجالي وغان حمدان. الطبعة: الطبعة الأولى، العام: 2019.</li> </ul>                                                                                                                                                                                                                                                                                                                                           | Yes                       |
| <b>Recommended Texts</b>                                               | <ol style="list-style-type: none"> <li>1. "حقوق الإنسان والديمقراطية"، تأليف: مصطفى كامل محمود. الطبعة: الطبعة الأولى، العام: 2015.</li> <li>2. "تاريخ حقوق الإنسان في العصور القديمة والوسطى"، تأليف: نبيل رزق. الطبعة: الطبعة الثالثة، العام: 2012.</li> <li>3. "حقوق الإنسان في العراق: الواقع والتحديات"، تأليف: سعد الله عباس. الطبعة: الطبعة الأولى، العام: 2014.</li> <li>4. "حقوق الإنسان في العراق: المفهوم والتطور"، تأليف: عبد الكريم السامرائي. الطبعة: الطبعة الأولى، العام: 2018.</li> <li>5. "حقوق الإنسان في العراق: بين التحديات والآفاق"، تأليف: محمد السامرائي ولقاء الحربي. الطبعة: الطبعة الأولى، العام: 2020.</li> </ol> | No                        |
| <b>Websites</b>                                                        | The Collage E-Library                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                           |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b>                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b><br><b>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                            | <b>A - Excellent</b>    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B - Very Good</b>    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C - Good</b>         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D - Satisfactory</b> | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E - Sufficient</b>   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br><b>(0 - 49)</b>                                                                                                                                                                                                                                                                                                                                                 | <b>FX - Fail</b>        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F - Fail</b>         | راسب                | (0-44)    | Considerable amount of work required  |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                    |                                           |                               |                                                                                                                                                                                                                                          |
|---------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية               |                                           |                               |                                                                                                                                                                                                                                          |
| Module Title                          | Engineering Mathematics                   |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                           | S                                         |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                           | CET2101                                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                          | 5                                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                          | 125                                       |                               |                                                                                                                                                                                                                                          |
| Module Level                          | 2                                         | Semester of Delivery          | 3                                                                                                                                                                                                                                        |
| Administering Department              | CET                                       | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                         | Ali Abbas Al-Sabbagh                      | e-mail                        | Aalsabbagh2014@my.fit.edu                                                                                                                                                                                                                |
| Module Leader's Acad. Title           | Lecturer                                  | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |
| Module Tutor                          |                                           |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                    | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval<br>Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |         |          |     |
|-----------------------------------|---------|----------|-----|
| العلاقة مع المواد الدراسية الأخرى |         |          |     |
| Prerequisite module               | CET1204 | Semester | Two |
| Co-requisites module              | None    | Semester |     |



## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 13. To develop problem solving skills and understanding of probability theory.<br>14. To distinguish aspects of probability terminology.<br>15. This course deals with the basic concept of Statistics.<br>16. To understand graphical representation of data measures.<br>17. To perform Simple Linear Regression.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 31. Recognize Basic terminology.<br>32. Describe Axioms for probability.<br>33. Discuss Conditional probabilities and independent events.<br>34. Explain random variable, Expectation and variance.<br>35. understand Bayes Theorem, PDF and CDF.<br>36. Define Expectation and variance of continuous random variables.<br>37. Identify Binomial, Poisson and Normal Distribution.<br>38. Discuss Joint and Marginal distributions aspects.<br>39. Discuss the Distributions of sums of independent random variables.<br>40. Explain Expectation and variance of sums of random variables, in addition to Covariance and correlation.<br>41. Describe Conditional expectation and Prediction.<br>42. Discuss Graphical Representation of frequency tables and charts, Measures of Central Tendency, and Dispersion.<br>43. Get acquainted with Relationship Modelling, Pearson's Correlation Coefficient.<br>44. Explain Significance of the correlation co-efficient and Simple Linear Regression.<br>45. Describe Chi Square test for association, Chi Square test of goodness of fit. |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <u>Part A - Probability</u><br>This part includes Sample spaces and events. Axioms for probability and their consequences. Conditional probabilities. Bayes' formula. Independent events. Definition of random variable. Discrete random variables. Expectation and variance. Bayes Theorem, Discrete Probability Distributions, The cumulative distribution function. Probability density function. Expectation and variance of continuous random variables. Binomial Distribution, Poisson Distribution, The Normal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Distribution, Joint distribution functions. Marginal distributions. Independent random variables. Distributions of sums of independent random variables. Expectation and variance of sums of random variables. Covariance and correlation. Conditional expectation. Prediction. <b>[33 hrs]</b> + Revision problem classes in weekly tutorials <b>[11 hrs]</b></p> <p><u>Part B - Statistics</u></p> <p>This part will take in details Graphical Representation - frequency tables and charts, Measures of Central Tendency, and Dispersion. Relationship Modelling, Pearson's Correlation Coefficient Significance of the correlation co-efficient, Simple Linear Regression Chi Square test for association, Chi Square test of goodness of fit <b>[12 hrs]</b> + Revision problem classes in weekly tutorials <b>[4 hrs]</b></p> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                              |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>This module will primarily focus on encouraging students to participate in the activities, as well as refining and developing their critical thinking skills. This will be achieved through lectures, tutorials, discussions, and grading activities.</p> |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 48  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 3.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 77  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                      |                 | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
|----------------------|-----------------|-------------|------------------|----------|---------------------------|
| Formative assessment | Quizzes         | 2           | 10% (10)         | 5, 10    | LO #1-4 , LO #5-9         |
|                      | Assignments     | 2           | 20% (10)         | 4, 11    | LO # 1-3 , LO # 4- 10     |
|                      | Projects / Lab. | N/A         |                  |          |                           |
|                      | Report          | 1           | 10% (10)         | 15       | LO # 1-14                 |
| Summative assessment | Midterm Exam    | 2 hr        | 10% (10)         | 8        | LO # 1-7                  |
|                      | Final Exam      | 3hr         | 50% (50)         | 16       | All                       |
| Total assessment     |                 |             | 100% (100 Marks) |          |                           |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|        | Material Covered                                                                                                                           |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1 | Basic terminology, Populations and Samples.                                                                                                |
| Week 2 | Sample spaces and events. Axioms for probability and their consequences.                                                                   |
| Week 3 | Conditional probabilities. Bayes' formula. Independent events.                                                                             |
| Week 4 | Definition of random variable. Discrete random variables. Expectation and variance.                                                        |
| Week 5 | Bayes Theorem, Discrete Probability Distributions, The cumulative distribution function.                                                   |
| Week 6 | Probability density function. Expectation and variance of continuous random variables.                                                     |
| Week 7 | Binomial Distribution, Poisson Distribution, The Normal Distribution                                                                       |
| Week 8 | Midterm Exam                                                                                                                               |
| Week 9 | Joint distribution functions. Marginal distributions. Independent random variables. Distributions of sums of independent random variables. |

|                |                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------|
| <b>Week 10</b> | Expectation and variance of sums of random variables. Covariance and correlation.                     |
| <b>Week 11</b> | Conditional expectation. Prediction.                                                                  |
| <b>Week 12</b> | Graphical Representation - frequency tables and charts, Measures of Central Tendency, and Dispersion. |
| <b>Week 13</b> | Relationship Modelling, Pearson's Correlation Co-efficient                                            |
| <b>Week 14</b> | Significance of the correlation co-efficient, Simple Linear Regression                                |
| <b>Week 15</b> | Chi Square test for association, Chi Square test of goodness of fit                                   |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                         |

### Delivery Plan (Weekly Tutorial)

المنهاج الاسبوعي الاضافي

#### Material Covered

Each week, a question sheet related to the material presented in the theoretical lecture will be solved and debated.

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                  | Available in the Library? |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | "Probability & Statistics for Engineers & Scientists", Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying E. Ye, Pearson Education, 9th edition, (August 19, 2016), ISBN-13:978-1292161365. | Yes                       |
| <b>Recommended Texts</b> | "Essential Mathematics and Statistics for Science", Graham Currell, Antony Dowman, Wiley, 2nd edition (June 22, 2009), ISBN-13:978-0470694480.                                                        | No                        |
| <b>Websites</b>          | <a href="https://users.cs.utah.edu/~jeffp/teaching/cs3130.html">https://users.cs.utah.edu/~jeffp/teaching/cs3130.html</a>                                                                             |                           |

### Grading Scheme

مخطط الدرجات

| Group                                     | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group</b><br><b>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                           | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                           | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                           | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                           | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br><b>(0 – 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                           | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                           |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                             |                               |                                                                                                                                                                                                                                                     |                          |
|------------------------------------|-----------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| معلومات المادة الدراسية            |                             |                               |                                                                                                                                                                                                                                                     |                          |
| Module Title                       | Object Oriented Programming |                               | Module Delivery                                                                                                                                                                                                                                     |                          |
| Module Type                        | S                           |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                          |
| Module Code                        | CET2102                     |                               |                                                                                                                                                                                                                                                     |                          |
| ECTS Credits                       | 6                           |                               |                                                                                                                                                                                                                                                     |                          |
| SWL (hr/sem)                       | 150                         |                               |                                                                                                                                                                                                                                                     |                          |
| Module Level                       | 2                           | Semester of Delivery          |                                                                                                                                                                                                                                                     | 3                        |
| Administering Department           | CET                         | College                       | EETC                                                                                                                                                                                                                                                |                          |
| Module Leader                      | Ali Hussein Jawad Almimar   |                               | e-mail                                                                                                                                                                                                                                              | alialmimar@altuff.edu.iq |
| Module Leader's Acad. Title        | Lecturer                    | Module Leader's Qualification | MSc                                                                                                                                                                                                                                                 |                          |
| Module Tutor                       |                             |                               |                                                                                                                                                                                                                                                     |                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein     |                               | e-mail                                                                                                                                                                                                                                              | osama.abbas@mtu.edu.iq   |
| Scientific Committee Approval Date | 29/10/2023                  | Version Number                | 1.0                                                                                                                                                                                                                                                 |                          |

| Relation with other Modules       |                                  |  |          |   |
|-----------------------------------|----------------------------------|--|----------|---|
| العلاقة مع المواد الدراسية الأخرى |                                  |  |          |   |
| Prerequisite module               | Programming Essentials / CET1203 |  | Semester | 2 |
| Co-requisites module              | None                             |  | Semester |   |

### Module Aims, Learning Outcomes and Indicative Contents

## أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>1. Understand and apply object-oriented programming principles.</li> <li>2. Design and implement object-oriented solutions to programming problems.</li> <li>3. Utilize C++ libraries and frameworks for application development.</li> <li>4. Implement data abstraction and encapsulation for secure and efficient code.</li> <li>5. Plan and execute testing strategies for reliable programs.</li> <li>6. Debug and optimize program performance for efficient execution.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Demonstrate a clear understanding of object-oriented programming principles, including inheritance, polymorphism, and encapsulation.</li> <li>2. Design and implement classes and objects to represent real-world entities, applying appropriate inheritance and encapsulation.</li> <li>3. Utilize C++ libraries and frameworks effectively to develop robust and scalable applications.</li> <li>4. Implement data abstraction and encapsulation techniques to ensure secure and efficient code.</li> <li>5. Plan and execute comprehensive testing strategies to validate the functionality and reliability of object-oriented programs.</li> <li>6. Identify and debug program errors using appropriate tools and techniques, enhancing program robustness.</li> <li>7. Evaluate and optimize program performance through code analysis and profiling, improving execution efficiency.</li> <li>8. Collaborate effectively with peers to develop object-oriented solutions to complex programming challenges.</li> <li>9. Apply exception handling techniques to handle errors and ensure program stability.</li> <li>10. Demonstrate proficiency in utilizing debugging tools to identify and fix program errors.</li> <li>11. Apply object-oriented design patterns and principles to analyze and solve programming problems.</li> <li>12. Evaluate the efficiency and effectiveness of object-oriented solutions through critical analysis and optimization techniques.</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><u>Part A: Introduction to Object-Oriented Programming (8 hours)</u></p> <ul style="list-style-type: none"> <li>- Overview of object-oriented programming principles and concepts</li> <li>- Classes, objects, and their relationships</li> <li>- Inheritance and polymorphism</li> <li>- Encapsulation and data abstraction</li> </ul> <p><u>Part B: Designing Object-Oriented Solutions (12 hours)</u></p> <ul style="list-style-type: none"> <li>- Problem analysis and requirements gathering</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>- Identifying classes and objects</li> <li>- Object-oriented design principles and patterns</li> <li>- Designing class hierarchies and relationships</li> <li>- UML diagrams for visualizing designs</li> </ul> <p><u>Part C: Implementing Object-Oriented Solutions in C++ (20 hours)</u></p> <ul style="list-style-type: none"> <li>- C++ language essentials for object-oriented programming</li> <li>- Implementing classes and objects in C++</li> <li>- Inheritance and polymorphism in C++</li> <li>- Handling exceptions in C++</li> <li>- Utilizing C++ libraries and frameworks</li> </ul> <p><u>Part D: Testing and Debugging Object-Oriented Programs (12 hours)</u></p> <ul style="list-style-type: none"> <li>- Testing methodologies and strategies</li> <li>- Unit testing and test-driven development</li> <li>- Integration testing and system testing</li> <li>- Debugging techniques and tools</li> <li>- Error handling and exception management</li> </ul> <p><u>Part E: Optimization and Performance Analysis (8 hours)</u></p> <ul style="list-style-type: none"> <li>- Profiling and performance analysis tools</li> <li>- Identifying performance bottlenecks</li> <li>- Optimization techniques for object-oriented programs</li> <li>- Memory management and resource optimization</li> </ul> <p><u>Part F: Collaborative Object-Oriented Programming (8 hours)</u></p> <ul style="list-style-type: none"> <li>- Collaborative development environments and version control systems</li> <li>- Code reviews and best practices</li> <li>- Pair programming and team collaboration</li> <li>- Communication and coordination in object-oriented projects</li> </ul> <p><u>Part G: Project Work and Application Development (20 hours)</u></p> <ul style="list-style-type: none"> <li>- Applying object-oriented principles and techniques in a practical project</li> <li>- Developing a complete application using C++ and object-oriented design</li> <li>- Project planning, implementation, and documentation</li> <li>- Integration of various modules and testing the application</li> </ul> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

استراتيجيات التعلم والتعليم



|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The learning and teaching strategies for the Object-Oriented Programming Course include lectures to introduce concepts, practical exercises for hands-on programming, group discussions for collaboration, case studies for real-world application, code reviews for feedback, practical projects to apply knowledge, guest lectures for industry insights, online resources for self-study, assessments to evaluate understanding, and presentations to enhance communication skills. These strategies aim to actively engage students, develop their programming abilities, and foster a deep understanding of object-oriented programming principles. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 79  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 5.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 71  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.73 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                  |            |                           |
|---------------------------------------------------|------------------------|-------------|------------------|------------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2           | 10% (5)          | 5,10       | LO #1 – 4, LO #1 – 9      |
|                                                   | <b>Assignments</b>     | 2           | 10% (10)         | 4,11       | LO #1 – 3, LO #4 – 10     |
|                                                   | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous | LO #1 – 12                |
|                                                   | <b>Report</b>          | 1           | 10% (10)         | 11         | LO # 1- 10                |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hrs.      | 10% (10)         | 7          | LO # 1-6                  |
|                                                   | <b>Final Exam</b>      | 4hrs.       | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>                           |                        |             | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                  |
|-------------------------------------------------------------------|--------------------------------------------------|
|                                                                   | <b>Material Covered</b>                          |
| <b>Week 1</b>                                                     | Introduction to Object-Oriented Programming      |
| <b>Week 2</b>                                                     | Classes, Objects, and Relationships              |
| <b>Week 3</b>                                                     | Inheritance and Polymorphism principles          |
| <b>Week 4</b>                                                     | Encapsulation and Data Abstraction               |
| <b>Week 5</b>                                                     | Problem Analysis and Requirements Gathering      |
| <b>Week 6</b>                                                     | Object-Oriented Design Principles and Patterns   |
| <b>Week 7</b>                                                     | <b>Mid-term Exam</b>                             |
| <b>Week 8</b>                                                     | C++ Language Essentials and Advanced Topics      |
| <b>Week 9</b>                                                     | Implementing Classes and Objects in C++          |
| <b>Week 10</b>                                                    | Implementing Inheritance and Polymorphism in C++ |
| <b>Week 11</b>                                                    | Handling Exceptions in C++                       |
| <b>Week 12</b>                                                    | Utilizing C++ Libraries and Frameworks           |
| <b>Week 13</b>                                                    | Testing Methodologies and Strategies in C++      |
| <b>Week 14</b>                                                    | Debugging Techniques and Tools in C++            |
| <b>Week 15</b>                                                    | Optimization and Performance Analysis in C++     |
| <b>Week 16</b>                                                    | <b>Preparatory week before the final Exam</b>    |

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

|         | Material Covered                                                               |
|---------|--------------------------------------------------------------------------------|
| Week 1  | Introduction to C++ programming environment and basic syntax.                  |
| Week 2  | Implementing simple classes and objects.                                       |
| Week 3  | Experimenting with inheritance and polymorphism in C++.                        |
| Week 4  | Implementing data abstraction and encapsulation.                               |
| Week 5  | Problem-solving exercise using object-oriented design principles and patterns. |
| Week 6  | Utilizing C++ libraries and frameworks for application development.            |
| Week 7  | <b>Midterm Exam (No lab session).</b>                                          |
| Week 8  | Implementing exception handling techniques in C++.                             |
| Week 9  | Testing and debugging strategies for object-oriented programs.                 |
| Week 10 | Profiling and performance analysis of C++ programs.                            |
| Week 11 | Code optimization techniques for object-oriented programming.                  |
| Week 12 | Collaborative programming exercise utilizing version control systems.          |
| Week 13 | Implementing advanced data structures using object-oriented techniques.        |
| Week 14 | Project work and application development using object-oriented concepts.       |
| Week 15 | review and practice exercises, Preparatory for Final Exam.                     |
| Week 16 | <b>Final Exam (No lab session).</b>                                            |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                   | Text                                                                                                                             | Available in the Library? |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Required Texts    | "Object-Oriented Programming in C++" by Robert Lafore                                                                            |                           |
| Recommended Texts | "Design Patterns: Elements of Reusable Object-Oriented Software" by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides |                           |
| Websites          | <a href="https://www.w3schools.com/cpp/cpp_oop.asp">https://www.w3schools.com/cpp/cpp_oop.asp</a>                                |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                        |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                        |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Computer Organization and Applications |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | core                                   |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET2103                                |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                      |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                                    |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 2                                      | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                                    | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mohammed mohsin ali                    | e-mail                        | mohammed.mohsin.albyate@altuff.edu.iq                                                                                                                                                                                                    |
| Module Leader's Acad. Title        | Assis. Lecturer                        | Module Leader's Qualification | MSC                                                                                                                                                                                                                                      |
| Module Tutor                       |                                        |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud             | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                             | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>32. Understand the basic components and organization of a computer system.</li> <li>33. Explain the function and operation of the CPU, memory, and I/O devices.</li> <li>34. Analyze and evaluate different computer architectures and their trade-offs.</li> <li>35. Design and implement basic computer systems using appropriate hardware and software components.</li> <li>36. Demonstrate an understanding of the relationship between computer organization and computer performance.</li> <li>37. Apply knowledge of computer organization principles to solve real-world computing problems.</li> <li>38. To develop essential skills in creating, saving, and opening documents in Microsoft Word, including formatting text and paragraphs and working with styles and themes.</li> <li>39. To explore advanced features in Microsoft Word, such as page layout options, working with headers, footers, and page numbers, and incorporating tables, images, and objects.</li> <li>40. To introduce spreadsheets and worksheets in Microsoft Excel, and develop students' skills in data entry, manipulation, and basic formulas and functions.</li> <li>41. To delve into advanced Microsoft Excel features, including working with ranges and cells, sorting and filtering data, and creating charts and graphs.</li> <li>42. To guide students in creating and editing slides in Microsoft PowerPoint, applying themes and templates, and adding text, images, and multimedia elements.</li> <li>43. To explore advanced PowerPoint features, such as slide transitions, animations, using SmartArt and shapes, and utilizing presenter tools and slide show options.</li> </ol> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>61. Understand the basic components and organization of a computer system.</li> <li>62. Explain the function and operation of the CPU, memory, and I/O devices.</li> <li>63. Analyze and evaluate different computer architectures and their trade-offs.</li> <li>64. Design and implement basic computer systems using appropriate hardware and software components.</li> <li>65. Demonstrate an understanding of the relationship between computer organization and computer performance.</li> <li>66. Apply knowledge of computer organization principles to solve real-world computing problems.</li> <li>67. demonstrate the ability to evaluate and compare different computer organization techniques, such as memory management strategies and caching</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p>optimizations, to improve system performance.</p> <p>68. Understand computer architectures, including their performance characteristics, and understand the impact of design choices on computer performance</p> <p>69. Develop practical skills in using simulation tools, emulators, and programming languages to design, implement, and test computer organization concepts.</p> <p>70. Analyze and identify performance bottlenecks in computer systems and propose appropriate optimizations to improve system efficiency.</p> <p>71. Understand the principles and challenges of memory management, including memory allocation, deallocation, and garbage collection.</p> <p>72. Apply knowledge of cache memory organization and mapping techniques to analyze cache behavior and optimize cache utilization.</p> <p>73. Demonstrate a solid understanding of Microsoft Word, Excel, and PowerPoint, including their key features, user interfaces, and common functions.</p> <p>74. Create, format, and manage documents effectively in Microsoft Word, utilizing styles, themes, page layout options, headers, footers, tables, images, and objects.</p> <p>75. Utilize Microsoft Excel for data entry, manipulation, basic calculations using formulas and functions, sorting and filtering data, and creating charts and graphs.</p> <p>76. Develop proficiency in creating and editing slides, applying themes, templates, and multimedia elements, and utilizing advanced features in Microsoft PowerPoint.</p> |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p>Introduction to Computer Organization</p> <p>Basic computer architecture and components Von Neumann architecture</p> <p>Instruction execution cycle</p> <p>Memory Organization</p> <p>Memory hierarchy and cache memory</p> <p>Virtual memory and paging techniques</p> <p>Memory management and allocation strategies</p> <p>PU Organization and Instruction Set Architecture (ISA)</p> <p>CPU components: ALU, registers, control unit</p> <p>Instruction formats and addressing modes</p> <p>Input/Output (I/O) Organization</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

|  |                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------|
|  | I/O devices and interfaces<br>Polling, interrupts, and DMA<br>I/O communication and bus architectures |
|--|-------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 5, 10      | LO #1-4 , LO #4-9         |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 4, 12      | LO # 1-3, LO #4-11        |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous | ALL                       |
|                             | <b>Report</b>          | 1           | 10% (10)         | 13         | LO # 1-11                 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2hr         | 10% (10)         | 9          | LO # 1-8                  |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |



| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                                                                                                                                        |
| <b>Week 1</b>                                                     | Introduction to Computer system organization and architecture.                                                                                                                                                                                 |
| <b>Week 2</b>                                                     | Von Neumann architecture and its components                                                                                                                                                                                                    |
| <b>Week 3</b>                                                     | Interfacing devices and system buses <ul style="list-style-type: none"> <li>• Tristate buffer</li> <li>• Decoder</li> <li>• Multiplexer</li> <li>• Address bus, data bus and control bus (specifications, function and interfacing)</li> </ul> |
| <b>Week 4</b>                                                     | Memory hierarchy <ul style="list-style-type: none"> <li>• Review of memory classification</li> <li>• Cache memory levels, Replacement Techniques, effective access time, read and write protocol</li> </ul>                                    |
| <b>Week 5-6</b>                                                   | Memory organization <ul style="list-style-type: none"> <li>• Memory requirements and memory expansion</li> <li>• Memory addresses and memory map</li> </ul>                                                                                    |
| <b>Week 7</b>                                                     | Midterm Exam                                                                                                                                                                                                                                   |
| <b>Week 8</b>                                                     | Basic computer microoperations <ul style="list-style-type: none"> <li>• Registers types, registers interconnection and data transfer</li> <li>• Arithmetic microoperation</li> <li>• Logical microoperation</li> </ul>                         |
| <b>Week 9</b>                                                     | Computer instructions <ul style="list-style-type: none"> <li>• instruction type and format</li> <li>• instruction addressing mode</li> </ul>                                                                                                   |
| <b>Week 10</b>                                                    | Control and timing unit <ul style="list-style-type: none"> <li>• decoding and executing instruction</li> <li>• instruction cycle</li> </ul>                                                                                                    |
| <b>Week 11-12</b>                                                 | Instruction Set <ul style="list-style-type: none"> <li>• register reference instruction</li> <li>• memory reference instruction</li> <li>• I/O reference instruction</li> </ul>                                                                |
| <b>Week 13</b>                                                    | Stack memory                                                                                                                                                                                                                                   |

|                |                                 |
|----------------|---------------------------------|
| <b>Week 14</b> | Input/output (I/O) Organization |
| <b>Week 15</b> | Interrupt and subroutines       |

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

|                | Material Covered                                                                                                                                                |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction to Computer Organization ,Familiarization with the lab environment and tools                                                                       |
| <b>Week 2</b>  | hardware components: CPU, memory, and I/O devices                                                                                                               |
| <b>Week 3</b>  | Introduction to Assembly Language Programming, microprocessor instruction set                                                                                   |
| <b>Week 4</b>  | register and memory transfer instructions                                                                                                                       |
| <b>Week 5</b>  | Arithmetic instructions                                                                                                                                         |
| <b>Week 6</b>  | Logical Instructions                                                                                                                                            |
| <b>Week 7</b>  | Stack instructions                                                                                                                                              |
| <b>Week 8</b>  | Loop and Subroutine programs                                                                                                                                    |
| <b>Week 9</b>  | Writing and executing simple assembly language programs                                                                                                         |
| <b>Week 10</b> | Introduction to Lab Environment and Office Suite: Microsoft Word Lab - Creating, editing, and formatting documents. Inserting and formatting images and tables. |
| <b>Week 11</b> | Microsoft Excel Lab - Creating spreadsheets and entering data. Formulas and functions for calculations.                                                         |
| <b>Week 12</b> | Data Analysis Lab with Excel - Advanced formula and function exercises. Sorting, filtering, and analyzing data.                                                 |
| <b>Week 13</b> | Microsoft PowerPoint Lab - Creating, editing, and designing slides. Adding multimedia elements and animations.                                                  |
| <b>Week 14</b> | Dealing with google form, customized the design, control the access, presents answers.                                                                          |

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

|                          | Text                                                                                                                                        | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | "Computer Architecture and Organization " by Moris Mano                                                                                     | no                        |
| <b>Recommended Texts</b> | "8085 Microprocessor and Programming "by Ramesh S. Gaonkar                                                                                  | yes                       |
| <b>Websites</b>          | <a href="https://www.tutorialspoint.com/computer_organization/index.asp">https://www.tutorialspoint.com/computer_organization/index.asp</a> |                           |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |                             |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |                             |
| Module Title                       | Electronic Fundamentals |                               | Module Delivery                                                                                                                                                                                                                          |                             |
| Module Type                        | Core                    |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                             |
| Module Code                        | CET2104                 |                               |                                                                                                                                                                                                                                          |                             |
| ECTS Credits                       | 5                       |                               |                                                                                                                                                                                                                                          |                             |
| SWL (hr/sem)                       | 125                     |                               |                                                                                                                                                                                                                                          |                             |
| Module Level                       | 2                       | Semester of Delivery          |                                                                                                                                                                                                                                          | 3                           |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |                             |
| Module Leader                      | Kadhim Sameer Ibrahim   |                               | e-mail                                                                                                                                                                                                                                   | khadum.sameer@altuff.edu.iq |
| Module Leader's Acad. Title        | lecturer                | Module Leader's Qualification | MSc.                                                                                                                                                                                                                                     |                             |
| Module Tutor                       |                         |                               | e-mail                                                                                                                                                                                                                                   |                             |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein |                               | e-mail                                                                                                                                                                                                                                   | osama.abbas@mtu.edu.iq      |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |                             |

| Relation with other Modules       |         |          |   |
|-----------------------------------|---------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |         |          |   |
| Prerequisite module               | CET1202 | Semester | 2 |
| Co-requisites module              | None    | Semester |   |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>44. To understand materials conductivity, semiconductor materials, and types</p> <p>45. This is the basic subject for all electronic circuits and devices.</p> <p>46. This course deals with first and the simplest semiconductor device, diode, diode physical construction, biasing, characteristics, application circuits and Zener</p> <p>47. Mathematical derivation and implementation of the load line analysis, and Q point with in diode characteristics curve to develop problem solving skills and understanding of diode circuits</p> <p>48. This course deals with second semiconductor device, BJT This course deals with BJT physical construction, biasing, configuration methods, input and output characteristics</p> <p>49. To understand the D.C biasing of BJT and circuit types , analysis and calculations of BJT parameters</p> <p>50. To understand and construct re model for BJT circuits</p> <p>51. To deal with small signal analysis of BJT</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>77. Recognize classifications of materials according to its conductivity.</p> <p>78. Identify the semiconductor material characteristics and classifications</p> <p>79. Recognize the physical structure and properties of P and N layers</p> <p>80. Identify diode as a first example of semiconductor devices.</p> <p>81. Discuss diode physical construction, biasing, and characteristics</p> <p>82. Identify the variable parameters of diodes, and V threshold</p> <p>83. Summarize what is meant by Load line analysis , and Q point</p> <p>84. Identify the applications of diodes in electrical circuits using AC. And DC. Power supplies</p> <p>85. To understand the concept of Zener region and the differences between zener and original diodes</p> <p>86. To solve zener circuits and calculate its voltage current with different cases</p> <p>87. To understand and discuss the second semiconductor device which is Transistor (Bipolar Junction Transistor)(BJT)</p> <p>88. To discuss BJT physical construction, Operation, and configuration methods</p> <p>89. To understand and implement input and output Characteristics of each configuration method and load line and Q point implementations</p> <p>90. To implement and solve BJT biasing circuit types and calculations of important parameters of BJT in DC. Biasing state</p> <p>91. Design BJT circuit types by using Quesent point parameters</p> <p>92. Understand and construct re model for BJT circuits</p> <p>93. Derive and calculate <math>Z_i</math>, <math>Z_o</math> <math>A_v</math> and <math>A_i</math> from re model of BJT circuits</p> <p>94. Understand and calculate small signal analysis of BJT</p> |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p>Semiconductor Materials Energy Levels , n- and p-Type, Semiconductor Diode Construction ,biasing, Characteristics and Zener Diodes, Load-Line Analysis [8 hrs]</p> <p>. Series Diode Configurations with DC Inputs, Parallel and Series-Parallel Configurations Sinusoidal Inputs Half-Wave Rectification, Full-Wave Rectification Clippers ,Clampers , Zener Diodes Voltage-Multiplier Circuit [10hrs]</p> <p>Transistor Construction , Transistor Operation ,Common-Base Configuration Transistor Amplifying Action ,Common-Emitter Configuration ,Common-Collector Configuration ,Limits of Operation [8hrs]</p> <p>Operating Point, Fixed-Bias Circuit , Emitter-Stabilized Bias Circuit , Voltage-Divider Bias , DC Bias with Voltage Feedback , Miscellaneous Bias Configurations, Design Operations Transistor Switching Networks, [[15 hrs]</p> <p>Revision problem classes [12 hrs]</p> <p>BJT Transistor Modeling The Important Parameters: <math>Z_i</math>, <math>Z_o</math>, <math>A_v</math>, <math>A_i</math> The r e Transistor Model The Hybrid Equivalent , small signal analysis Common-Emitter Fixed-Bias Configuration , Voltage-Divider Bias CE Emitter-Bias Configuration Emitter-Follower Configuration Common-Base Configuration[11 hr]</p> |

| <p><b>Learning and Teaching Strategies</b><br/>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                       | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|---------------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                                   |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                              | Quizzes         | 2           | 10% (10)         | 5, 12      | LO #1- 4, LO #5-12        |
|                                                   | Assignments     | 2           | 10% (5)          | 4, 11      | LO # 1-3, LO #4-10        |
|                                                   | Projects / Lab. | 1           | 10% (10)         | Continuous | ALL                       |
|                                                   | Report          | 1           | 10% (10)         | 13         | LO # 1-12                 |
| Summative assessment                              | Midterm Exam    | 2 hr        | 10% (10)         | 6          | LO #1-8                   |
|                                                   | Final Exam      | 4 hr        | 50% (50)         | 16         | All                       |
| Total assessment                                  |                 |             | 100% (100 Marks) |            |                           |

**Delivery Plan (Weekly Syllabus)**

## المنهاج الاسبوعي النظري

|                | Material Covered                                                                                                                          |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction, Semiconductor Materials, Energy Levels , Extrinsic Materials—n- and p-Type                                                  |
| <b>Week 2</b>  | Semiconductor Diode construction, biasing, characteristics, Zener region                                                                  |
| <b>Week 3</b>  | Load-Line Analysis, RESISTANCE LEVELS, DIODE EQUIVALENT CIRCUITS                                                                          |
| <b>Week 4</b>  | Series Diode Configurations with DC Inputs , Parallel and Series- Parallel Configurations                                                 |
| <b>Week 5</b>  | Sinusoidal Inputs; Half-Wave Rectification, Full-Wave Rectification                                                                       |
| <b>Week 6</b>  | <b>Midterm Exam</b>                                                                                                                       |
| <b>Week 7</b>  | Clipper's series and parallel ,Clampers , Zener Diodes, Introduction , Transistor Construction                                            |
| <b>Week 8</b>  | Transistor Operation, Common-Base Configuration Transistor, Amplifying Action , Common-Emitter Configuration , Limits of Operation        |
| <b>Week 9</b>  | Operating Point, Fixed-Bias Circuit ,Emitter-Stabilized Bias Circuit ,                                                                    |
| <b>Week 10</b> | Voltage-Divider Bias , DC Bias with Voltage Feedback , Miscellaneous Bias Configurations                                                  |
| <b>Week 11</b> | Design Operations , Transistor Switching Networks                                                                                         |
| <b>Week 12</b> | Amplification in the AC Domain, BJT Transistor Modeling ,The Important Parameters: $Z_i$ , $Z_o$ , $A_v$ , $A$<br>The re Transistor Model |
| <b>Week 13</b> | Small signal analysis                                                                                                                     |
| <b>Week 14</b> | Common-Emitter Fixed-Bias Configuration Voltage-Divider Bias                                                                              |
| <b>Week 15</b> | CE Emitter-Bias Configuration Emitter-Follower Configuration Common-Base Configuration                                                    |

**Delivery Plan (Weekly Lab. Syllabus)**

## المنهاج الاسبوعي للمختبر

|               | Material Covered                         |
|---------------|------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction                      |
| <b>Week 2</b> | Lab 2: Diode characteristics             |
| <b>Week 3</b> | Lab 3 Zener diode characteristics        |
| <b>Week 4</b> | Lab 4 Half wave rectifier                |
| <b>Week 5</b> | Lab 5: full wave rectifier               |
| <b>Week 6</b> | Half and full wave rectifier with filter |
| <b>Week 7</b> | Lab 7: clippers                          |



| Learning and Teaching Resources |                                                 |                           |
|---------------------------------|-------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                 |                           |
|                                 | Text                                            | Available in the Library? |
| Required Texts                  | Electronic devices and circuit theory Poylested | Yes                       |
| Recommended Texts               | .                                               | No                        |
| Websites                        |                                                 |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                            |                      |                                                                                                                                                                                                                                          |                           |
|------------------------------------|----------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| معلومات المادة الدراسية            |                            |                      |                                                                                                                                                                                                                                          |                           |
| Module Title                       | Communication Fundamentals |                      | Module Delivery                                                                                                                                                                                                                          |                           |
| Module Type                        | Core                       |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                           |
| Module Code                        | CET2105                    |                      |                                                                                                                                                                                                                                          |                           |
| ECTS Credits                       | 5                          |                      |                                                                                                                                                                                                                                          |                           |
| SWL (hr/sem)                       | 125                        |                      |                                                                                                                                                                                                                                          |                           |
| Module Level                       | 2                          | Semester of Delivery |                                                                                                                                                                                                                                          | 3                         |
| Administering Department           | CET                        | College              | EETC                                                                                                                                                                                                                                     |                           |
| Module Leader                      | Qasim Abbood Mahdi         |                      | e-mail                                                                                                                                                                                                                                   | Kasim.abood@altuff.edu.iq |
| Module Leader's Acad. Title        | Ast.Professor              |                      | Module Leader's Qualification                                                                                                                                                                                                            | Ph.D.                     |
| Module Tutor                       |                            |                      |                                                                                                                                                                                                                                          |                           |
| Peer Reviewer Name                 | Alhamzah taher mohammed    |                      | e-mail                                                                                                                                                                                                                                   | alhamza_tm@mtu.edu.iq     |
| Scientific Committee Approval Date | 29/10/2023                 |                      | Version Number                                                                                                                                                                                                                           | 1.0                       |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |
|----------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |
|                                                          |

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b><br/>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>1. Understanding the communication systems and signals.</li> <li>2. Viewing and knowledge block diagram communication system</li> <li>3. Analyzing the advantage and disadvantage of each type of signals and systems.</li> <li>4. Analyzing signals in Fourier series and Fourier transform.</li> <li>5. To develop problem solving skills and understanding of filters types and design</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Module Learning Outcomes</b><br/>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Recognize Basic Principles of Communication.</li> <li>2. Explain the Block Diagram of a Communication System.</li> <li>3. Identify essential parts that must be present in communication systems.</li> <li>4. List the different types of media used in a communication system.</li> <li>5. Describe the measured effect of noise on a communication system.</li> <li>6. Define modulation over some carriers to make it suitable for transmission over a long distance.</li> <li>7. Discuss Principles of Signals in Communication and shows examples of signals of various types.</li> <li>8. Identify the difference between Analog and Digital Signals.</li> <li>9. List the various types of continuous-time signals</li> <li>10. Discuss the classification of signals based on their characteristics and nature of availability.</li> <li>11. Define the advantages and disadvantages of each type of signal in communications.</li> <li>12. Explain the two the Fourier Series in the Continuous Domain is associated with the important classes of Fourier series methods and Trigonometric Fourier series.</li> <li>13. Summarize by various magnitudes or coefficients of Exponential Fourier Series on Determination for different harmonic signals.</li> <li>14. Definition A major disadvantage of the Fourier series is on account of its periodicity, by means of the limitation of the Fourier series</li> <li>15. Identify Fourier transform representation for the non-periodic signals</li> <li>16. Describe the Inverse Fourier transform as a mathematical transformation technique that transforms signals from the continuous-frequency domain to the corresponding time domain and vice-versa</li> <li>17. Definition Filters, four basic types of filters: Passive or Active depending on the Construction of filters.</li> <li>18. Describe the filter depending on the design of filters: Low Pass Filter (LPF), High Pass Filter (HPF), Band Pass Filter (BPF) and Band Stop Filter (BSF).</li> <li>19. Summarize the design formula for a passive filter LPF and HPF consisting of coils, capacitors, and resistors.</li> <li>20. Identify the design formula for a passive filter Constant-K: LPF , HPF, and BPF consisting of coils, capacitors, and resistors .</li> <li>21. Definition active filters, listing the advantage of active filter over disadvantage of passive filter.</li> <li>22. Identify the design formula for active filter first order LPF, HPF and BPF used op-Amp as main component.</li> </ol> |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b>Part A</b> -Communication System : Basic Principles of Communication System, types of media</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                               | <p>used in a communication system, effect of noise on a communication system and modulation in analogue communication (10 hr)</p> <p><b>Part B</b> Signals in Communication: Principles of Signals, examples of signals of various types, difference between Analog and Digital Signals, various types of continuous-time signals, classification of signals based on their characteristics and nature of availability and the advantages and disadvantages of each type of signal in communications.(15 hr)</p> <p><b>Part C- I-</b> Fourier Series in the Continuous Domain: the important classes of Fourier series methods and Trigonometric Fourier series, Exponential Fourier ( 5 hr)</p> <p><b>Part C- II:</b> Fourier transform representation: disadvantage of the Fourier series, Fourier transform for non-periodic signals, Inverse Fourier transform as a mathematical transformation technique.(10 hr)</p> <p><b>Part D-</b> Filters: basic types of filters: Passive and Active , design of filters: Low Pass Filter (LPF), High Pass Filter (HPF), Band Pass Filter (BPF) and Band Stop Filter (BSF),design formula for each type of filters for passive and active.(34 hr)</p> |
| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Strategies</b>                                                             | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطالب موزع على (15) اسبوع</b> |     |                                                                            |      |
|----------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل         | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل   | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل                | 125 |                                                                            |      |

|                                                          |
|----------------------------------------------------------|
| <b>Module Evaluation</b><br><b>تقييم المادة الدراسية</b> |
|----------------------------------------------------------|

|                      |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|----------------------|-----------------|-------------|------------------|------------|---------------------------|
| Formative assessment | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1- 4, LO #5- 15       |
|                      | Assignments     | 2           | 10% (10)         | 2, 12      | LO # 1-7,, LO #8- 18      |
|                      | Projects / Lab. | 1           | 10% (10)         | Continuous |                           |
|                      | Report          | 1           | 10% (10)         | 13         | LO # 1-17                 |
| Summative assessment | Midterm Exam    | 2 hr        | 10% (10)         | 7          | LO # 1-16                 |
|                      | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment     |                 |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|        | Material Covered                                                                                                                                                                                                                                     |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1 | Basic Principles of Communication: Introduction to Communication, The Block Diagram of a Communication System                                                                                                                                        |
| Week 2 | Signals: Principles of Signals & Definition, Difference between Analog and Digital Signals                                                                                                                                                           |
| Week 3 | Types of continuous-time signals: (Unit–Step Function, Unit –Ramp Function, Impulse Function, Unit –Parabola Function, Signum Function, Rectangular Function, Triangular Function, Real Exponential Signal, Sinusoidal Function & Sampling Function) |
| Week 4 | Classification of Signals , Continuous –Time Signal, Discrete- Time Signals ,Even Signals, Odd Signals , Deterministic Signals, Random Signals, Sinusoidal Signals, Complex Exponential Signals                                                      |
| Week 5 | Solved Problems: Periodic Signals, Aperiodic Signals ,Solved Problems: Energy Signals ,Power Signals                                                                                                                                                 |
| Week 6 | Fourier series: The Fourier Series in Continuous Domain, Trigonometric Fourier series and                                                                                                                                                            |

|                |                                                                                                                                                                                               |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Solved Examples , Exponential Fourier series and Solved Examples . Fourier Transform : Fourier Transform Examples                                                                             |
| <b>Week 7</b>  | <b>Midterm Exam</b>                                                                                                                                                                           |
| <b>Week 8</b>  | Inverse Fourier Transform Example: The Inverse Fourier Transform                                                                                                                              |
| <b>Week 9</b>  | Filters : Types of filters : Classification Based on Construction and Design<br>RC-LPF, RC-HPF<br>BPF (Low Pass Filter Stage and High Pass Filter Stage) (Type 1& Type 2)<br>Band Stop Filter |
| <b>Week 10</b> | Passive Filters : Formula and Procedure of Design RL-LPF, RL-HPF                                                                                                                              |
| <b>Week 11</b> | LC- LPF, Constant-K-(T& $\pi$ Section)<br>LC- HPF, Constant-K-(T& $\pi$ Section)<br>LC- BPF, Constant-K-(T& $\pi$ Section)                                                                    |
| <b>Week 12</b> | Band Pass Filter Stage) (Type 1& Type 2)                                                                                                                                                      |
| <b>Week 13</b> | Active Filters<br>Comparison Between Passive & Active Filters                                                                                                                                 |
| <b>Week 14</b> | First- Order LPF<br>First- Order HPF                                                                                                                                                          |
| <b>Week 15</b> | BPF Active Filter & Band reject or Notch Filter                                                                                                                                               |
| <b>Week 16</b> | Preparatory week before the final Exam                                                                                                                                                        |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                                             |
|---------------|------------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to Lab Instruments                                       |
| <b>Week 2</b> | Lab 2: Function Generator and Oscilloscope.                                  |
| <b>Week 3</b> | Lab 3: Introduction to filters types construction                            |
| <b>Week 4</b> | Lab 4: Fourier series and Fourier Transform examples using the Math Function |
| <b>Week 5</b> | Lab 5: Introduction to filters types design                                  |
| <b>Week 6</b> | Lab 6: Introduction to Passive filters                                       |
| <b>Week 7</b> | Lab 7: Introduction to active filters                                        |
| <b>Week 8</b> | Lab 8: Constant-K-(T& $\pi$ Section) construction                            |
| <b>Week 9</b> | Lab 9: Constant-K-(T& $\pi$ Section) design                                  |

|                |                                                     |
|----------------|-----------------------------------------------------|
| <b>Week 10</b> | Lab 10: Constant-K-(T& $\pi$ Section) LC- LPF       |
| <b>Week 11</b> | Lab 11: Constant-K-(T& $\pi$ Section) LC-HPF        |
| <b>Week 12</b> | Lab 12: Constant-K-(T& $\pi$ Section)- BPF          |
| <b>Week 13</b> | Lab 13: Constant-K-(T& $\pi$ Section)- BPF – Type-1 |
| <b>Week 14</b> | Lab 14: Constant-K-(T& $\pi$ Section)-BPF –Type-2   |

| Learning and Teaching Resources |                                                                                                                                                |                           |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                |                           |
|                                 | Text                                                                                                                                           | Available in the Library? |
| <b>Required Texts</b>           | Principles of Communication Systems By J.S.Chitode, First Edition-2007<br>Modern Digital and Analog Communication Systems ,By B.P.Lathi OXFORD | Yes                       |
| <b>Recommended Texts</b>        | Analog and Digital Communications, By Schaum Second Edition<br>Data Communications and Networking, By Behrouz A. Forouzan, Fifth Edition       | No                        |
| <b>Websites</b>                 |                                                                                                                                                |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |
| Module Title                       | English Language II     |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | B                       |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | MTU1003                 |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 2                       |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 50                      |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 1                       | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Zinah Hayder Hammodi    | e-mail                        | zinah.alhusseini@altuff.edu.iq                                                                                                                                                                                                           |
| Module Leader's Acad. Title        | Asst. Professor         | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |
| Module Tutor                       |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein | e-mail                        | Osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               |      | Semester |  |
| Co-requisites module              | None | Semester |  |



## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Objectives</b></p> <p>أهداف المادة الدراسية</p>                | <ol style="list-style-type: none"> <li>1. Provide students with essential information in the English language in association with reading, writing and speaking skills, and knowing more English vocabulary.</li> <li>2. To understand sentences, tenses, and practicing writing.</li> <li>3. This module works towards enhancing students' English language competencies along with their technical or professional knowledge.</li> <li>4. Enhancing students' communication skills in English can result in better job opportunities in the future</li> </ol>                                                                                                                                                                                                                                                                                                                  |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>The student will have the ability to:</p> <ol style="list-style-type: none"> <li>1. Know the English skills of reading, and writing.</li> <li>2. Recognize other English language skills such as: grammar, vocabulary.</li> <li>3. Understand and appreciate the importance of grammar aspects and vocabulary to increase the ability of communicating ideas about the English language.</li> <li>4. Understand sentences with multiple clauses, and comparative and superlative.</li> <li>5. Understand time expression in tenses, and active and passive voice.</li> <li>6. Discuss distinguish words such as do and make, like and alike, and other and another.</li> <li>7. Discuss the various skills of writing such as writing essays, developing supporting ideas, and writing a paragraph.</li> <li>8. Enhance students' communication skills in English.</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b><u>Part A: Sentences and Tenses.</u></b></p> <p>an overview of verb tenses, comparatives and superlatives, time expression in tenses, active and passive voice, distinguish words, Verb Patterns, Quantity, Time and Conditional Clauses, and articles. [15 hrs]</p> <p><b><u>Part B: Reading and Writing Skills</u></b></p> <p>Writing essays, expressing yourself, common expressions, developing supporting ideas, types of writing, and how to write a paragraph. [15 hrs]</p>                                                                                                                                                                                                                                                                                                                                       |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>The main strategies that will be adopted in delivering this module are:</p> <ul style="list-style-type: none"> <li>- Allow students to actively participate in the learning process with class discussions and exercises that support the initiative.</li> <li>- Use didactic questioning through questions to determine student understanding of the material.</li> <li>- Writing an assignment and report that encourages students to clarify and organize their thinking and independently research and present on a topic.</li> </ul> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |           |                                                                           |      |
|--------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 33        | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 2.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17        | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 1.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | <b>50</b> |                                                                           |      |

## Module Evaluation

### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks) | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|----------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)       | 3 , 10     | LO# 1-2, LO# 3-9          |
|                             | <b>Assignments</b>     | 2           | 20% (10)       | 4, 12      | LO# 1-3, LO# 3-11         |
|                             | <b>Projects / Lab.</b> | NA          |                |            |                           |
|                             | <b>Report</b>          | 1           | 10% (10)       | Continuous |                           |

|                             |                     |     |                  |    |         |
|-----------------------------|---------------------|-----|------------------|----|---------|
| <b>Summative assessment</b> | <b>Midterm Exam</b> | 2hr | 10% (10)         | 5  | LO# 1-4 |
|                             | <b>Final Exam</b>   | 3hr | 50% (50)         | 16 | All     |
| <b>Total assessment</b>     |                     |     | 100% (100 Marks) |    |         |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|               | Material Covered                                                                                                                                                                                                                                                                                            |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | <b>Unit 1:</b> Grammar: Tenses (Present, Past, and Future), Questions, Questions word<br>Vocabulary: Parts of speech, adjective, preposition, word with more than one meaning<br>Reading and writing Skill, Everyday English (Social Expression)                                                            |
| <b>Week 2</b> | <b>Unit 2:</b> Grammar: Present Tenses (Present Simple, Present Continuous) Tens, have/have got<br>Vocabulary: Description countries, Collection<br>Reading and writing Skill, make conversation, Asking question                                                                                           |
| <b>Week 3</b> | <b>Unit 3:</b> Grammar: Past Tenses (Past Simple, Past Continuous)<br>Vocabulary: Irregular verbs, making connections, nouns, verbs, and adjectives, Making negatives<br>Reading and writing Skill, Everyday English (Time Expression)                                                                      |
| <b>Week 4</b> | <b>Unit 4:</b> Grammar: Quantity, Articles, and some and Any<br>Vocabulary: Buying Things<br>Reading and writing Skill, Everyday English (Prices and shopping)                                                                                                                                              |
| <b>Week 5</b> | <b>Midterm Exam</b>                                                                                                                                                                                                                                                                                         |
| <b>Week 6</b> | <b>Unit 5:</b> Grammar: Verb Patterns 1, Future intentions<br>Vocabulary: Hot verbs<br>Reading and writing skills, Everyday English (How do you feel?)<br><b>Unit 6:</b> Grammar: What's it like?, Comparative and superlative adjectives.<br>Vocabulary: Talking about towns, Money, Synonyms and antonyms |

|                |                                                                                                                                                                                                                                               |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Reading and writing Skill, Everyday English (Directions)                                                                                                                                                                                      |
| <b>Week 7</b>  | <b>Unit 7:</b> Grammar: Present Perfect and Past Simple, for and since, Tense revision<br>Vocabulary: Past participles, Adverbs, Word pairs.<br>Reading and writing Skill, Everyday English (short answers)                                   |
| <b>Week 8</b>  | <b>Unit 8:</b> Grammar: Have (got) to, Should, Must<br>Vocabulary: Jobs, Traveling abroad, Words that go together, Compound nouns<br>Reading and writing Skill, Everyday English (At the doctor's)                                            |
| <b>Week 9</b>  | <b>Unit 9:</b> Grammar: Time and Conditional Clauses, What if?<br>Vocabulary: Hot verbs, Hotels<br>Reading and writing Skill, Everyday English (In a hotel)                                                                                   |
| <b>Week 10</b> | <b>Unit 10:</b> Grammar: Verb Patterns 2, Infinitives, Purpose, (What, etc.+ infinitive), (something, etc.+ infinitive)<br>Vocabulary: Shops, describe feelings and situations.<br>Reading and writing Skill, Everyday English (Exclamations) |
| <b>Week 11</b> | <b>Unit 11:</b> Grammar: Active and Passive Voice<br>Vocabulary: Verbs and past participles, verbs and nouns that go together<br>Reading and writing Skill, Everyday English (Notices)                                                        |
| <b>Week 12</b> | <b>Unit 12:</b> Grammar: Second conditional, might<br>Vocabulary: Phrasal verbs<br>Reading and writing Skill, Everyday English (Social expression 2)                                                                                          |
| <b>Week 13</b> | <b>Unit 13:</b> Grammar: Present Perfect Continuous, Present Perfect Simple versus Continuous<br>Vocabulary: Job and the alphabet game, Word formation, Adverb<br>Reading and writing Skill, Everyday English (Telephoning)                   |
| <b>Week 14</b> | <b>Unit 14:</b> Grammar: Past Perfect, Reported statements<br>Vocabulary: Word in context<br>Reading and writing Skill, Everyday English (Saying goodbye)                                                                                     |
| <b>Week 15</b> | Grammar: Distinguish make and do, will and would, like, alike, unlike, and dislike, and other, another, and others<br>Vocabulary<br>Reading and writing Skill                                                                                 |

| Learning and Teaching Resources |                                                                                                 |                           |
|---------------------------------|-------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                 |                           |
|                                 | Text                                                                                            | Available in the Library? |
| Required Texts                  | New Headway Plus/ Pre-Intermediate, John and Liz Soars, Oxford University Press                 | NO                        |
| Recommended Texts               | Understanding and Using English Grammar, 5 <sup>th</sup> Edition, Betty S. Azar Stacy A. Hagen. | NO                        |
| Websites                        |                                                                                                 |                           |

| Grading Scheme              |                  |                     |          |                                       |
|-----------------------------|------------------|---------------------|----------|---------------------------------------|
| مخطط الدرجات                |                  |                     |          |                                       |
| Group                       | Grade            | التقدير             | Marks %  | Definition                            |
| Success Group<br>(50 - 100) | A - Excellent    | امتياز              | 90 - 100 | Outstanding Performance               |
|                             | B - Very Good    | جيد جدا             | 80 - 89  | Above average with some errors        |
|                             | C - Good         | جيد                 | 70 - 79  | Sound work with notable errors        |
|                             | D - Satisfactory | متوسط               | 60 - 69  | Fair but with major shortcomings      |
|                             | E - Sufficient   | مقبول               | 50 - 59  | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)      | FX – Fail        | راسب (قيد المعالجة) | (45-49)  | More work required but credit awarded |
|                             | F – Fail         | راسب                | (0-44)   | Considerable amount of work required  |
|                             |                  |                     |          |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                         |                               |                                                                                                                                                                                                                               |
|------------------------------------|-----------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                         |                               |                                                                                                                                                                                                                               |
| Module Title                       | The crimes of the Ba'ath regime in Iraq |                               | Module Delivery                                                                                                                                                                                                               |
| Module Type                        | B                                       |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | MTU1007                                 |                               |                                                                                                                                                                                                                               |
| ECTS Credits                       | 2                                       |                               |                                                                                                                                                                                                                               |
| SWL (hr/sem)                       | 50                                      |                               |                                                                                                                                                                                                                               |
| Module Level                       | 2                                       | Semester of Delivery          |                                                                                                                                                                                                                               |
| Administering Department           | CET                                     | College                       | EETC                                                                                                                                                                                                                          |
| Module Leader                      | Khudair Safi                            |                               | e-mail                                                                                                                                                                                                                        |
| Module Leader's Acad. Title        | Assistant Lecturer                      | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                         |
| Module Tutor                       |                                         | e-mail                        |                                                                                                                                                                                                                               |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah Taher Mohammed     | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                         |
| Scientific Committee Approval Date | 29/10/2023                              | Version Number                | 1.0                                                                                                                                                                                                                           |

| Relation with other Modules       |      |  |          |
|-----------------------------------|------|--|----------|
| العلاقة مع المواد الدراسية الأخرى |      |  |          |
| Prerequisite module               | None |  | Semester |
| Co-requisites module              | None |  | Semester |

### Module Aims, Learning Outcomes and Indicative Contents

| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><br>أهداف المادة الدراسية                      | <p>يهدف هذا المقرر الدراسي إلى تعزيز فهم الطلاب للجرائم والانتهاكات التي وقعت خلال فترة نظام البعث في العراق وتأثيرها على الأفراد والمجتمع، وتشجيع التحليل والنقاش حول هذه القضايا المهمة. ومن أبرز الأهداف للمادة الدراسية هي اني يكون الطالب قادراً على أن :</p> <ol style="list-style-type: none"> <li>1. فهم مفهوم الجرائم وأقسامها.</li> <li>2. دراسة جرائم نظام البعث والقوانين المتعلقة بها.</li> <li>3. التعرف على الجرائم النفسية والاجتماعية وآثارها على الفرد والمجتمع.</li> <li>4. تحليل الانتهاكات القانونية في العراق، بما في ذلك الانتهاكات لحقوق الإنسان والجرائم ذات الصلة.</li> <li>5. فهم الجرائم البيئية وآثارها، بما في ذلك التلوث وتدمير المدن والقرى وتجفيف الأهوار.</li> <li>6. دراسة جرائم المقابر الجماعية وفهم أحداث المقابر والتصنيف الزمني لها في العراق.</li> </ol>                                                                                                                                                                                                                      |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية | <p>مخرجات التعلم للمادة الدراسية هي:</p> <ol style="list-style-type: none"> <li>1. فهم مفهوم الجرائم وقدرة الطلاب على تصنيف الجرائم وفقاً لأقسامها.</li> <li>2. تحليل جرائم نظام البعث وفهم القوانين المتعلقة بها، بما في ذلك الجرائم الدولية.</li> <li>3. القدرة على التعرف على الجرائم النفسية لنظام البعث وفهم الآثار النفسية لجرائم نظام البعث على الأفراد والمجتمع.</li> <li>4. القدرة على التعرف على الجرائم الاجتماعية لنظام البعث الآثار الاجتماعية لجرائم نظام البعث على الأفراد والمجتمع.</li> <li>5. التعرف على الانتهاكات القانونية لنظام البعث في العراق وفهم أنواع الانتهاكات ومكان احتجاز الأفراد.</li> <li>6. التعرف على صور انتهاكات حقوق الإنسان وجرائم السلطة التي وقعت خلال فترة نظام البعث</li> <li>7. التعرف على الانتهاكات السياسية والعسكرية لنظام البعث</li> <li>8. فهم الجرائم البيئية لنظام البعث والقدرة على تحليل تأثيرها على البيئة والمجتمع.</li> <li>9. دراسة جرائم المقابر الجماعية لنظام البعث</li> <li>10. فهم الأحداث المرتبطة بجرائم المقابر الجماعية وتصنيفها زمنياً.</li> </ol> |
| <b>Indicative Contents</b><br><br>المحتويات الإرشادية                | <p>المحتويات الإرشادية في مادة اللغة تشمل مجموعة من المفاهيم والمواضيع التي يتم تغطيتها خلال عملية التعلم. ومن بين المحتويات الإرشادية المهمة:</p> <ol style="list-style-type: none"> <li>1. تعريف الجريمة لغة واصطلاحاً، مفهوم الجريمة، اقسام الجريمة</li> <li>2. جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام 2005</li> <li>3. الجرائم النفسية والاجتماعية وأثارها</li> <li>4. عسكرة المجتمع، موقف النظام البعثي من الدين</li> <li>5. انتهاكات القوانين العراقية، صور انتهاكات حقوق الإنسان وجرائم السلطة</li> <li>6. بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث</li> <li>7. أماكن السجون والاحتجاز لنظام البعث</li> <li>8. الجرائم البيئية لنظام البعث في العراق</li> <li>9. جرائم المقابر الجماعية</li> <li>10. أحداث مقابر الإبادة الجماعية المرتكبة من النظام البعثي في العراق</li> <li>11. التصنيف الزمني لمقابر الإبادة الجماعية في العراق للمدة 1963 م - 2003 م</li> </ol>                                                                                                 |

## Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | استراتيجيات التعلم والتعليم المستخدمة في مادة جرائم حزب البعث تشمل مجموعة متنوعة من النهج والتقنيات التي تعزز عملية التعلم للطلاب. من بين هذه الاستراتيجيات:                                                        |
|                   | 1. التفاعل النشط: يتم تشجيع الطلاب على المشاركة والمشاركة الفعالة في الدروس من خلال المناقشات الجماعية والأنشطة التفاعلية.                                                                                          |
|                   | 2. التعلم التعاوني: يشجع التعاون والتعاون بين الطلاب من خلال العمل الجماعي والمشاريع الجماعية، حيث يتعاون الطلاب مع بعضهم البعض لتحقيق أهداف التعلم المحددة.                                                        |
|                   | 3. استخدام التقنيات الحديثة: يستفيد الطلاب من استخدام التكنولوجيا في عملية التعلم، مثل استخدام الحواسيب والإنترنت للبحث والتعلم الذاتي.                                                                             |
|                   | 4. توفير ردود فعل فورية: يتم توفير ردود فعل فورية وتقييم مستمر للطلاب، سواء عن طريق التقييمات الشفهية أو الكتابية، مما يساعدهم على تحسين أدائهم وتطوير مهاراتهم.                                                    |
|                   | 5. التنوع في وسائل التواصل: يتم استخدام مجموعة متنوعة من وسائل التواصل والتعليم، مثل المحاضرات التوضيحية، والمناقشات الجماعية، والأنشطة العملية، والعروض التقديمية، لتلبية احتياجات وأساليب التعلم المختلفة للطلاب. |

| <b>Student Workload (SWL)</b>               |    |                                          |      |
|---------------------------------------------|----|------------------------------------------|------|
| الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا     |    |                                          |      |
| <b>Structured SWL (h/sem)</b>               | 33 | <b>Structured SWL (h/w)</b>              | 2.2  |
| الحمل الدراسي المنتظم للطلاب خلال الفصل     |    | الحمل الدراسي المنتظم للطلاب أسبوعيا     |      |
| <b>Unstructured SWL (h/sem)</b>             | 17 | <b>Unstructured SWL (h/w)</b>            | 1.13 |
| الحمل الدراسي غير المنتظم للطلاب خلال الفصل |    | الحمل الدراسي غير المنتظم للطلاب أسبوعيا |      |
| <b>Total SWL (h/sem)</b>                    | 50 |                                          |      |
| الحمل الدراسي الكلي للطلاب خلال الفصل       |    |                                          |      |

| <b>Delivery Plan (Weekly Syllabus)</b>     |                                                                                               |  |
|--------------------------------------------|-----------------------------------------------------------------------------------------------|--|
| المنهاج الاسبوعي النظري                    |                                                                                               |  |
| الأسبوع الأول                              | تعريف الجريمة لغة واصطلاحاً، مفهوم الجريمة، اقسام الجريمة                                     |  |
| الأسبوع الثاني                             | جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام 2005                    |  |
| الأسبوع الثالث                             | الجرائم النفسية لنظام البعث وفهم الآثار النفسية لجرائم نظام البعث على الأفراد والمجتمع.       |  |
| الأسبوع الرابع                             | الجرائم الاجتماعية لنظام البعث وفهم الآثار الاجتماعية لجرائم نظام البعث على الأفراد والمجتمع. |  |
| الأسبوع الخامس                             | انتهاكات القوانين العراقية                                                                    |  |
| الأسبوع السادس                             | بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث                                          |  |
| الأسبوع السابع                             | امتحان نصف الفصل                                                                              |  |
| الأسبوع الثامن                             | الجرائم البيئية لنظام البعث في العراق (التلوث الحربي وسياسة الأرض المحروقة)                   |  |
| الأسبوع التاسع والعاشر                     | تجفيف الاهوار و تجريف بساتين النخيل والأشجار والمزروعات                                       |  |
| الأسبوع الحادي عشر و الأسبوع الثاني عشر    | جرائم المقابر الجماعية واحداث مقابر الإبادة الجماعية المرتكبة من النظام البعث في العراق       |  |
| الأسبوع الثالث عشر والرابع عشر والخامس عشر | التصنيف الزمني لمقابر الإبادة الجماعية في العراق للمدة من (1963-2003) م                       |  |



|                       |                 |                          |                  |          |                           |
|-----------------------|-----------------|--------------------------|------------------|----------|---------------------------|
|                       |                 | التهيئة للامتحان النهائي |                  |          | الأسبوع السادس عشر        |
| Module Evaluation     |                 |                          |                  |          |                           |
| تقييم المادة الدراسية |                 |                          |                  |          |                           |
|                       |                 | Time/<br>Number          | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 2                        | 10% (5)          | 3, 11    | LO #1, 2, LO #3- 10       |
|                       | Assignments     | 3                        | 20% (10)         | 6, 13    | LO # 1-4, LO #5-10        |
|                       | Projects / Lab. |                          |                  |          |                           |
|                       | Report          | 1                        | 10% (10)         | 14       | LO # 1-10                 |
| Summative assessment  | Midterm Exam    | 2 hours                  | 10% (20)         | 7        | LO # 1-5                  |
|                       | Final Exam      | 3 hours                  | 50% (50)         | 16       | All                       |
| Total assessment      |                 |                          | 100% (100 Marks) |          |                           |

|                                                                 |                                                                                     |                                  |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------|
| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                     |                                  |
|                                                                 | <b>Text</b>                                                                         | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                           | منهاج وزارة التعليم العالي والبحث العلمي العراقية - جرائم نظام البعث في العراق 2023 | Yes                              |
| <b>Recommended Texts</b>                                        |                                                                                     | No                               |
| <b>Websites</b>                                                 | The Collage E-Library                                                               |                                  |

|                                       |                      |                |                  |                                |
|---------------------------------------|----------------------|----------------|------------------|--------------------------------|
| <b>Grading Scheme</b><br>مخطط الدرجات |                      |                |                  |                                |
| <b>Group</b>                          | <b>Grade</b>         | <b>التقدير</b> | <b>Marks (%)</b> | <b>Definition</b>              |
| <b>Success Group<br/>(50 - 100)</b>   | <b>A - Excellent</b> | امتياز         | 90 - 100         | Outstanding Performance        |
|                                       | <b>B - Very Good</b> | جيد جدا        | 80 - 89          | Above average with some errors |
|                                       | <b>C - Good</b>      | جيد            | 70 - 79          | Sound work with notable errors |

|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |         |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|---------|---------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69 | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59 | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> - Fail        | راسب (قيد المعالجة) | (45-49) | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> - Fail         | راسب                | (0-44)  | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |         |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |         |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                           |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                           |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Advanced Engineering Mathematics          |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | S                                         |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET2201                                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                                       |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 2                                         | Semester of Delivery          | Four                                                                                                                                                                                                                                     |
| Administering Department           | CET                                       | College                       | EECT                                                                                                                                                                                                                                     |
| Module Leader                      | Ali Abbas Al-Sabbagh                      | e-mail                        | Aalsabbagh2014@my.fit.edu                                                                                                                                                                                                                |
| Module Leader's Acad. Title        | Lecturer                                  | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |
| Module Tutor                       |                                           |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |         |          |   |
|-----------------------------------|---------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |         |          |   |
| Prerequisite module               | CET2101 | Semester | 3 |
| Co-requisites module              | None    | Semester |   |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br><b>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><b>أهداف المادة الدراسية</b>                                                                               | 18. To develop problem solving skills complex analysis.<br>19. To understand power series.<br>20. To the way around Fourier series.<br>21. To get the grip on using Laplace transform.<br>22. To develop a good understanding of ODEs.<br>23. This course deals with Advanced Engineering Mathematics.                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | 1. Describe Complex environment.<br>2. Discuss derivative of Analytic Function.<br>3. Describe Exponential, Trigonometric and Hyperbolic Functions.<br>4. Explain Line Integral in the Complex Plane and Cauchy's Integral Formula.<br>5. Using power Series and how to expand a function<br>6. Identify elements of Fourier Series.<br>7. Identify elements of Laplace Transform.<br>8. Discuss different aspects of First-Order ODEs.<br>9. Identify Bernoulli Equation and Population Dynamics.<br>10. Discuss different aspects of Second-Order Linear ODEs.<br>11. Using Variation of Parameters.<br>12. Discuss different aspects of Higher Order Linear ODEs.<br>13. Using Power Series to solve ODE. |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                              | <p>14. Explain Fourier Series solution of ODE.</p> <p>15. Discuss Laplace Transform solution of ODE.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p><u>Part A – Complex Analysis.</u></p> <p>This part includes Complex Numbers. Polar Form of Complex Numbers. Powers and Roots. Complex variables. Complex Function. Derivative. Analytic Function. Cauchy–Riemann and Laplace’s Equation. Exponential, Trigonometric and Hyperbolic Functions. Euler’s Formula. Logarithm. Line Integral in the Complex Plane. Cauchy’s Integral Formula. Derivatives of Analytic Functions. <b>[12 hrs]</b> + Revision problem classes in weekly tutorials <b>[4 hrs]</b></p> <p><u>Part B – Preliminaries to Methods of solving ODE.</u></p> <p>This part includes Power Series. Functions Given by Power Series. Fourier Series. Arbitrary Period. Even and Odd Functions. Fourier Analysis for Periodic Functions. Fourier series Formula of a function. Differentiation and Integration of Fourier Series Laplace Transform. Transforms of Derivatives and Integrals. Table of Laplace Transforms. inverse Laplace transform <b>[9 hrs]</b> + Revision problem classes in weekly tutorials <b>[3 hrs]</b></p> <p><u>Part C – ODE.</u></p> <p>This part includes First-Order ODEs. Separable ODEs. Exact ODEs. Integrating Factors. Linear ODEs. Bernoulli Equation. Population Dynamics. Second-Order Linear ODEs. Homogeneous. Homogeneous with Constant Coefficients. Nonhomogeneous ODEs. Solution by Variation of Parameters. Higher Order Linear ODEs. Homogeneous Linear ODEs. Homogeneous Linear ODEs with Constant Coefficients. Nonhomogeneous Linear ODEs. Power Series solution of ODE. Fourier Series solution of ODE. Laplace Transform solution of ODE. <b>[24 hrs]</b> + Revision problem classes in weekly tutorials <b>[8 hrs]</b></p> |

| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                          | <p>This module will primarily focus on encouraging students to participate in the activities, as well as refining and developing their critical thinking skills. This will be</p> |

|  |                                                                            |
|--|----------------------------------------------------------------------------|
|  | achieved through lectures, tutorials, discussions, and grading activities. |
|--|----------------------------------------------------------------------------|

| Student Workload (SWL)                                                         |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| الحمل الدراسي للطالب موزع على (15) اسبوع                                       |     |                                                                            |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 48  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 3.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 77  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| Module Evaluation     |                 |             |                  |            |                           |
|-----------------------|-----------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |                 |             |                  |            |                           |
|                       |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1-4, LO #5-9          |
|                       | Assignments     | 2           | 20% (10)         | 3, 11      | LO # 1,2 , LO# 3-10       |
|                       | Projects / Lab. | N/A         |                  |            |                           |
|                       | Report          | 1           | 10% (10)         | Continuous | LO#1-14                   |
| Summative assessment  | Midterm Exam    | 2 hr        | 10% (10)         | 8          | LO # 1-7                  |
|                       | Final Exam      | 3hr         | 50% (50)         | 16         | All                       |
| Total assessment      |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |
|---------------------------------|
| المناهج الاسبوعي النظري         |

|                | Material Covered                                                                                                                                                                           |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Complex Numbers. Polar Form of Complex Numbers. Powers and Roots. Complex variables.                                                                                                       |
| <b>Week 2</b>  | Complex Function. Derivative. Analytic Function. Cauchy–Riemann and Laplace’s Equation.                                                                                                    |
| <b>Week 3</b>  | Exponential, Trigonometric and Hyperbolic Functions. Euler’s Formula. Logarithm.                                                                                                           |
| <b>Week 4</b>  | Line Integral in the Complex Plane. Cauchy’s Integral Formula. Derivatives of Analytic Functions                                                                                           |
| <b>Week 5</b>  | Power Series. Functions Given by Power Series.                                                                                                                                             |
| <b>Week 6</b>  | Fourier Series. Arbitrary Period. Even and Odd Functions. Fourier Analysis for Periodic Functions. Fourier series Formula of a function. Differentiation and Integration of Fourier Series |
| <b>Week 7</b>  | Laplace Transform. Transforms of Derivatives and Integrals. Table of Laplace Transforms. inverse Laplace transform                                                                         |
| <b>Week 8</b>  | <b>Midterm Exam</b>                                                                                                                                                                        |
| <b>Week 9</b>  | First-Order ODEs. Separable ODEs. Exact ODEs. Integrating Factors. Linear ODEs. Bernoulli Equation. Population Dynamics.                                                                   |
| <b>Week 10</b> | Second-Order Linear ODEs. Homogeneous. Homogeneous with Constant Coefficients.                                                                                                             |
| <b>Week 11</b> | Nonhomogeneous ODEs. Solution by Variation of Parameters.                                                                                                                                  |
| <b>Week 12</b> | Higher Order Linear ODEs. Homogeneous Linear ODEs. Homogeneous Linear ODEs with Constant Coefficients. Nonhomogeneous Linear ODEs.                                                         |
| <b>Week 13</b> | Power Series solution of ODE.                                                                                                                                                              |
| <b>Week 14</b> | Fourier Series solution of ODE.                                                                                                                                                            |
| <b>Week 15</b> | Laplace Transform solution of ODE.                                                                                                                                                         |

### Delivery Plan (Weekly Tutorial)

المنهاج الاسبوعي الاضافي

|                                                                                                                      | Material Covered |
|----------------------------------------------------------------------------------------------------------------------|------------------|
| Each week, a question sheet related to the material presented in the theoretical lecture will be solved and debated. |                  |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                     | Available in the Library? |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | "Advanced Engineering Mathematics ", Erwin Kreyszig, Wiley, 10th edition (August 16, 2011), ISBN-13: 978-0470458365.                                     | Yes                       |
| <b>Recommended Texts</b> | "Differential Equations for Engineers and Scientists", Yunus Cengel, William Palm, McGraw Hill, 1st edition (January 31, 2012), ISBN-13: 978-0073385907. | No                        |
| <b>Websites</b>          | <a href="https://www.coursera.org/learn/differential-equations-engineers">https://www.coursera.org/learn/differential-equations-engineers</a>            |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.



## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                           |                               |                                                                                                                                                                                                                                          |                          |
|------------------------------------|---------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| معلومات المادة الدراسية            |                           |                               |                                                                                                                                                                                                                                          |                          |
| Module Title                       | Python Programming        |                               | Module Delivery                                                                                                                                                                                                                          |                          |
| Module Type                        | S                         |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                          |
| Module Code                        | CET2202                   |                               |                                                                                                                                                                                                                                          |                          |
| ECTS Credits                       | 4                         |                               |                                                                                                                                                                                                                                          |                          |
| SWL (hr/sem)                       | 100                       |                               |                                                                                                                                                                                                                                          |                          |
| Module Level                       | 2                         | Semester of Delivery          |                                                                                                                                                                                                                                          | 4                        |
| Administering Department           | CET                       | College                       | EETC                                                                                                                                                                                                                                     |                          |
| Module Leader                      | Ali Hussein Jawad Almimar |                               | e-mail                                                                                                                                                                                                                                   | alialmimar@altuff.edu.iq |
| Module Leader's Acad. Title        | Lecturer                  | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |                          |
| Module Tutor                       |                           |                               |                                                                                                                                                                                                                                          |                          |
| Peer Reviewer Name                 | Dr. Osama abbas hussein   | e-mail                        | Osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |                          |
| Scientific Committee Approval Date | 29/10/2023                | Version Number                | 1.0                                                                                                                                                                                                                                      |                          |

| Relation with other Modules       |                                  |  |          |   |
|-----------------------------------|----------------------------------|--|----------|---|
| العلاقة مع المواد الدراسية الأخرى |                                  |  |          |   |
| Prerequisite module               | Programming Essentials / CET1203 |  | Semester | 2 |
| Co-requisites module              | None                             |  | Semester |   |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br><b>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><b>أهداف المادة الدراسية</b>                                                                               | <p>52. Introduce students to the fundamental concepts and principles of Python programming language.</p> <p>53. Develop students' proficiency in writing Python code and solving programming problems.</p> <p>54. Familiarize students with essential programming constructs, such as variables, data types, control flow structures, and functions.</p> <p>55. Provide students with a solid foundation in object-oriented programming (OOP) and its application in Python.</p> <p>56. Enable students to work with various data structures and perform operations on them.</p> <p>57. Prepare students for practical application of Python in real-world scenarios, such as data manipulation, web scraping, and GUI development.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | <ol style="list-style-type: none"> <li>1. Understand the fundamentals of Python programming language, including variables, data types, and basic operators.</li> <li>2. Demonstrate proficiency in control flow structures, such as conditional statements and loops, to control program execution.</li> <li>3. Develop functions and utilize function arguments to enhance code modularity and reusability.</li> <li>4. Utilize exception handling techniques to effectively manage errors and ensure program robustness.</li> <li>5. Gain familiarity with modules and packages to leverage existing code and extend Python's functionality.</li> <li>6. Understand object-oriented programming (OOP) concepts and apply them to create classes, objects, and inheritance hierarchies.</li> <li>7. Manipulate strings, lists, dictionaries, and sets to efficiently store and retrieve data.</li> <li>8. Perform file handling operations, including reading from and writing to files.</li> <li>9. Apply Python to practical tasks, such as web scraping, data manipulation, and analysis.</li> <li>10. Demonstrate proficiency in working with files and directories, including navigating file systems and managing file permissions.</li> <li>11. Develop graphical user interfaces (GUIs) using Python libraries to create interactive applications.</li> <li>12. Prepare for exams by reviewing course materials, practicing exercises, and answering sample questions.</li> </ol> |
| <b>Indicative Contents</b><br><b>المحتويات الإرشادية</b>                                                                         | <p>Indicative content includes the following.</p> <p><u>Part A: Introduction to Python and Basic Concepts (Estimated time: 10 hours)</u></p> <p>Overview of Python programming language</p> <p>Installation and setup</p> <p>Variables and data types</p> <p>Basic operators</p> <p>Input and output operations</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|  |                                                                                                                                                                                                                                                      |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><u>Part B: Control Flow and Functions (Estimated time: 16 hours)</u></p> <p>Conditional statements (if, else, elif)</p> <p>Loops and iterations (for loop, while loop)</p> <p>Functions and function arguments</p> <p>Recursion</p>               |
|  | <p><u>Part C: Data Structures and File Handling (Estimated time: 16 hours)</u></p> <p>Strings and string manipulation</p> <p>Lists and list manipulation</p> <p>Dictionaries and sets</p> <p>File handling and input/output operations</p>           |
|  | <p><u>Part D: Advanced Topics (Estimated time: 16 hours)</u></p> <p>Exception handling and error management</p> <p>Modules and packages</p> <p>Object-oriented programming (OOP) concepts</p> <p>Classes, objects, inheritance, and polymorphism</p> |
|  | <p><u>Part E: Applications and Practical Projects (Estimated time: 16 hours)</u></p> <p>Working with files and directories</p> <p>GUI programming</p> <p>Web scraping</p> <p>Data manipulation and analysis</p>                                      |
|  |                                                                                                                                                                                                                                                      |

| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                          | <p>Effective learning and teaching strategies involve creating an engaging and interactive learning environment. This can be achieved through a combination of various approaches, such as incorporating active learning techniques like group discussions, problem-solving activities, and hands-on experiments. Additionally, employing visual aids, multimedia resources, and real-world examples can enhance comprehension and retention. Encouraging student participation and providing timely feedback also play vital roles in fostering student engagement and understanding. It is important to promote a growth mindset, encourage critical thinking, and create opportunities for collaboration and peer learning. By employing these strategies, educators can facilitate meaningful learning experiences and empower students to become active participants in their own learning journey.</p> |

| Student Workload (SWL)<br>الحمل الدراسي للطالب موزع على ( 15 ) اسبوع           |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 36  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2.4  |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |      |

| Module Evaluation<br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|--------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                            |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                       | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1-5, LO #5-8          |
|                                            | Assignments     | 1           | 10% (10)         | 9          | LO# 1-8                   |
|                                            | Projects / Lab. | 1           | 10% (10)         | Continuous |                           |
|                                            | Report          | 1           | 10% (10)         | 13         | LO # 1-12                 |
| Summative assessment                       | Midterm Exam    | 2 hrs.      | 10% (10)         | 7          | LO # 1-7                  |
|                                            | Final Exam      | 4hrs.       | 50% (50)         | 16         | All                       |
| Total assessment                           |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus)<br>المنهاج الاسبوعي النظري |                                                                    |
|------------------------------------------------------------|--------------------------------------------------------------------|
|                                                            | Material Covered                                                   |
| Week 1                                                     | Introduction to Python, Variables, Data Types, and Basic Operators |
| Week 2                                                     | Control Flow and Conditional Statements                            |
| Week 3                                                     | Loops and Iterations                                               |
| Week 4                                                     | Strings and String Manipulation                                    |
| Week 5                                                     | Lists and List Manipulation                                        |
| Week 6                                                     | Dictionaries and Sets                                              |
| Week 7                                                     | Midterm Exam                                                       |
| Week 8                                                     | Functions and Function Arguments                                   |
| Week 9                                                     | File Handling and Input/Output Operations                          |

|                |                                            |
|----------------|--------------------------------------------|
| <b>Week 10</b> | Exception Handling and Error Management    |
| <b>Week 11</b> | Modules and Packages                       |
| <b>Week 12</b> | Object-Oriented Programming (OOP) Concepts |
| <b>Week 13</b> | Classes and Objects                        |
| <b>Week 14</b> | Inheritance and Polymorphism               |
| <b>Week 15</b> | Working with Files and Directories         |

| Delivery Plan (Weekly Lab. Syllabus) |                                                                                                             |                           |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------|
| المنهاج الاسبوعي للمختبر             |                                                                                                             |                           |
|                                      | Material Covered                                                                                            |                           |
| Week 1                               | Introduction to Python, Variables, and Basic Operators                                                      |                           |
| Week 2                               | Control Flow and Conditional Statements                                                                     |                           |
| Week 3                               | Loops and Iterations                                                                                        |                           |
| Week 4                               | Strings and String Manipulation                                                                             |                           |
| Week 5                               | Lists and List Manipulation                                                                                 |                           |
| Week 6                               | Dictionaries and Sets                                                                                       |                           |
| Week 7                               | Midterm Exam (No lab session).                                                                              |                           |
| Week 8                               | Functions and Function Arguments                                                                            |                           |
| Week 9                               | File Handling and Input/Output Operations                                                                   |                           |
| Week 10                              | Exception Handling and Error Management                                                                     |                           |
| Week 11                              | Modules and Packages                                                                                        |                           |
| Week 12                              | Object-Oriented Programming (OOP) Concepts                                                                  |                           |
| Week 13                              | Classes and Objects                                                                                         |                           |
| Week 14                              | Inheritance and Polymorphism                                                                                |                           |
| Week 15                              | Working with Files and Directories                                                                          |                           |
| Week 16                              | Final Exam (No lab session).                                                                                |                           |
| Learning and Teaching Resources      |                                                                                                             |                           |
| مصادر التعلم والتدريس                |                                                                                                             |                           |
|                                      | Text                                                                                                        | Available in the Library? |
| Required Texts                       | Title: "Python Crash Course: A Hands-On, Project-Based Introduction to Programming"<br>Author: Eric Matthes |                           |

|                          |                                                                  |    |
|--------------------------|------------------------------------------------------------------|----|
| <b>Recommended Texts</b> | Title: "Learning Python"<br>Author: Mark Lutz                    | No |
| <b>Websites</b>          | URL: <a href="https://realpython.com">https://realpython.com</a> |    |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                            |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                            |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Microprocessors            |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                       |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET2203                    |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 2                          | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                        | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Salman Rasheed Owaid       | e-mail                        | Rasheedsalman161@gmail.com                                                                                                                                                                                                               |
| Module Leader's Acad. Title        | Ass. Professor             | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                    |
| Module Tutor                       |                            | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                 | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |                                                 |          |   |
|-----------------------------------|-------------------------------------------------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |                                                 |          |   |
| Prerequisite module               | Computer Organization & Architecture ( CET2103) | Semester | 3 |
| Co-requisites module              | None                                            | Semester |   |

| Module Aims, Learning Outcomes and Indicative Contents |
|--------------------------------------------------------|
|--------------------------------------------------------|

| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 58. To understand the basic operating concept of specific microprocessor.<br>59. To study the hardware architecture of specific microprocessor.<br>60. To encode programs based on the specific processor language.<br>61. To solve problems encountered in the architecture of a specific microprocessor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 95. Identify the basic characteristic of specific processor<br>96. Define the processor signals and their functions<br>97. Explain the architecture from the hardware point of view<br>98. Identify various machine cycle.<br>99. Explain the memory different interfacing techniques with the microprocessor.<br>100. Explain the input output different interfacing techniques with the microprocessor.<br>101. Explain the concept of Stack memory.<br>102. List the addressing mode of the processor instruction.<br>103. Encode different program based on assembly.<br>104. Perform different arithmetic and logical operations using the processor instruction set.<br>105. Encode different problems associative with branching instructions.<br>106. Solve problem encountered with delay and counter.<br>107. Identify different interrupt procedures.<br>108. Design different interfacing systems due to the problem requirements. |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | Indicative content includes the following.<br><br><u>Part A – Microprocessor H/W architecture</u><br>--MP signals, MP operations, Machine cycle, memory interfacing, input-output devices interfaces [30hrs]<br><br><u>Part b – Microprocessor S/W architecture</u><br>--Instruction set, data transfer, arithmetic, logical. [25 hrs]<br>--Stack register and stack area [15hrs]<br>--Branching instructions and applications [20hrs]<br>--Revision problem classes [10 hrs]                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

## Module Evaluation

### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 7, 10      | LO #1- 6, LO #8-11        |
|                             | <b>Assignments</b>     | 4           | 10% (10)         | Continuous |                           |
|                             | <b>Projects / Lab.</b> | 5           | 10% (10)         | Continuous |                           |
|                             | <b>Report</b>          | 2           | 10% (10)         | 7,10       | LO #1- 6, LO # 8-11       |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 6          | LO # 1-6                  |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

**Delivery Plan (Weekly Syllabus)**

المنهاج الاسبوعي النظري

|                | Material Covered                                                     |
|----------------|----------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction - microprocessor evolution                              |
| <b>Week 2</b>  | Basics specific microprocessor architecture and its specifications   |
| <b>Week 3</b>  | Microprocessor signals and machine cycle                             |
| <b>Week 4</b>  | Memory organization, interfacing and memory map                      |
| <b>Week 5</b>  | Input devices interfacing, Output devices interfacing                |
| <b>Week 6</b>  | <b>Midterm Exam</b>                                                  |
| <b>Week 7</b>  | Introduction to microprocessor assembly language and addressing mode |
| <b>Week 8</b>  | Data transfer instruction                                            |
| <b>Week 9</b>  | Arithmetic instructions                                              |
| <b>Week 10</b> | logical instruction                                                  |
| <b>Week 11</b> | Stack register , stack area and related instructions                 |
| <b>Week 12</b> | Branching instruction                                                |
| <b>Week 13</b> | Delay and counters                                                   |
| <b>Week 14</b> | Interrupt concept and types                                          |
| <b>Week 15</b> | <b>Subroutine</b>                                                    |

**Delivery Plan (Weekly Lab. Syllabus)**

المنهاج الاسبوعي للمختبر

|               | Material Covered                                                                 |
|---------------|----------------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to microprocessor kit                                        |
| <b>Week 2</b> | Lab 2: key function definition, read/write memory location, read/write registers |
| <b>Week 3</b> | Lab 3: Data transfer instructions                                                |
| <b>Week 4</b> | Lab 4: Arithmetic instructions                                                   |
| <b>Week 5</b> | Lab 5: logical instruction                                                       |
| <b>Week 6</b> | Lab 6: Stack instructions                                                        |
| <b>Week 7</b> | Lab 7: Branching instruction                                                     |

**Learning and Teaching Resources**

| مصادر التعلم والتدريس |                                                                                                                                                                                               |                           |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                       | Text                                                                                                                                                                                          | Available in the Library? |
| Required Texts        | 8085 $\mu$ p architecture and programming_Gonkar                                                                                                                                              | Yes                       |
| Recommended Texts     | UNDERSTANDING 8085/8086 MICROPROCESSORS and PERIPHERAL ICs                                                                                                                                    | no                        |
| Websites              | <a href="https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering">https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering</a> |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                         |                      |                                                                                                                                                                                                                                          |                           |
|------------------------------------|-------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| معلومات المادة الدراسية            |                         |                      |                                                                                                                                                                                                                                          |                           |
| Module Title                       | Analog Communications   |                      | Module Delivery                                                                                                                                                                                                                          |                           |
| Module Type                        | Core                    |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                           |
| Module Code                        | CET2204                 |                      |                                                                                                                                                                                                                                          |                           |
| ECTS Credits                       | 5                       |                      |                                                                                                                                                                                                                                          |                           |
| SWL (hr/sem)                       | 125                     |                      |                                                                                                                                                                                                                                          |                           |
| Module Level                       | 2                       | Semester of Delivery |                                                                                                                                                                                                                                          | 4                         |
| Administering Department           | CET                     | College              | EETC                                                                                                                                                                                                                                     |                           |
| Module Leader                      | Qasim Abbood Mahdi      |                      | e-mail                                                                                                                                                                                                                                   | Kasim.abood@altuff.edu.iq |
| Module Leader's Acad. Title        | Ast.Professor           |                      | Module Leader's Qualification                                                                                                                                                                                                            | Ph.D.                     |
| Module Tutor                       |                         |                      |                                                                                                                                                                                                                                          |                           |
| Peer Reviewer Name                 | Alhamzah Taher Mohammed |                      | e-mail                                                                                                                                                                                                                                   | alhamza_tm@mtu.edu.iq     |
| Scientific Committee Approval Date | 29/10/2023              |                      | Version Number                                                                                                                                                                                                                           | 1.0                       |
| Relation with other Modules        |                         |                      |                                                                                                                                                                                                                                          |                           |
| العلاقة مع المواد الدراسية الأخرى  |                         |                      |                                                                                                                                                                                                                                          |                           |
| Prerequisite module                | CET2105                 |                      | Semester                                                                                                                                                                                                                                 | 3                         |
| Co-requisites module               | None                    |                      | Semester                                                                                                                                                                                                                                 |                           |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                            |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                            |
| Module Aims<br>أهداف المادة الدراسية                     | 6. Understanding the modulation and de-modulation<br>7. Viewing and knowledge Amplitude modulation and Frequency modulation.<br>8. Analyzing the advantage and disadvantage of AM over FM. |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>9. Analyzing the generation and detection each of AM and FM.</p> <p>5. To develop problem solving skills and understanding of PM equations</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Recognize Basic Principles of modulation and de-modulation</li> <li>2. Explain the Need for Modulation.</li> <li>3. Define a Carrier Wave, Radio Frequency Spectrum, Sound and Radio Broadcasting</li> <li>4. Identify Amplitude Modulation, Percent Modulation, Upper and Lower Sidebands</li> <li>5. Explain Methods of Modulation.</li> <li>6. Mathematical Analysis of a Modulated Carrier Wave</li> <li>7. Discuss forms of Amplitude Modulation and Methods of Amplitude Modulation.</li> <li>8. Describe the Power Relation in an AM Wave.</li> <li>9. Identify modulating Amplifier Circuit: AM- Transmitter &amp; Radio Receiver Essential Parameter</li> <li>10. Explain the AM generation of SSB, DSB-SC balanced modulators (Cowan &amp; Ring).</li> <li>11. Summarize various demodulation type of AM Signal: AM-Detector (Envelope &amp; Synchronous)</li> <li>12. Identify the Frequency Modulation Process: Modulation Index, Deviation Ratio, Percent Modulation and FM Sidebands.</li> <li>13. Discuss the relationship between the modulation index and number of sidebands.</li> <li>14. List the various types of generation of FM (the direct method and indirect method) &amp; demodulation or detection.</li> <li>15. Identify the comparison between AM and FM.</li> <li>16. Discuss Principles of FM Receiver: FM Discriminator (Foster – Seeley &amp; Ratio Detector).</li> <li>17. Explain the Phase modulation (PM) Definition.</li> <li>18. Discuss the PM equation and PM wave forms</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b>Part A</b> –MODULATION AND DEMODULATION: Need for Modulation,, Define a Carrier Wave, Radio Frequency Spectrum, Sound and Radio Broadcasting. (20 hr)</p> <p><b>Part B</b>- Amplitude Modulation: Percent Modulation, Upper and Lower Sidebands , Methods of Modulation , Mathematical Analysis of a Modulated Carrier Wave, forms of Amplitude Modulation and Methods of Amplitude Modulation, Power Relation in an AM Wave,. Identify modulating Amplifier Circuit: AM- Transmitter &amp; Radio Receiver Essential Parameter, The AM generation of SSB, DSB-SC balanced modulators (Cowan &amp; Ring), demodulation type of AM Signal: AM-Detector (Envelope &amp; Synchronous) ( 30hr)</p> <p><b>Part C</b> Frequency Modulation Process: Modulation Index, Deviation Ratio, Percent Modulation and FM Sidebands, the relationship between the</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|  |                                                                                                                                                                                                                                                                                                                      |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | modulation index and number of sidebands, generation of FM (the direct method and indirect method) & demodulation or detection, the comparison between AM and FM, FM Receiver :FM Discriminator (Foster –Seeley &Ratio Detector), the Phase modulation (PM) Definition and the PM equation and PM wave forms.(24 hr) |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

#### Strategies

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                      |                 | Time/Number | Weight (Marks) | Week Due   | Relevant Learning Outcome |
|----------------------|-----------------|-------------|----------------|------------|---------------------------|
| Formative assessment | Quizzes         | 2           | 10% (10)       | 5, 10      | LO #1-6 , LO #6-11        |
|                      | Assignments     | 2           | 10% (10)       | 2, 12      | LO # 1,2 , LO #3-11       |
|                      | Projects / Lab. | 1           | 10% (10)       | Continuous |                           |
|                      | Report          | 1           | 10% (10)       | 13         | LO # 1-14                 |
| Summative assessment | Midterm Exam    | 2 hr        | 10% (10)       | 7          | LO # 1-8                  |
|                      | Final Exam      | 4hr         | 50% (50)       | 16         | All                       |

|                  |                  |  |  |
|------------------|------------------|--|--|
| Total assessment | 100% (100 Marks) |  |  |
|------------------|------------------|--|--|

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|               | Material Covered                                                                             |
|---------------|----------------------------------------------------------------------------------------------|
| <b>Week 1</b> | MODULATION AND DEMODULATION: Forms of Amplitude Modulation , Methods of Amplitude Modulation |
| <b>Week 2</b> | Carrier Wave, Radio Frequency Spectrum, Sound, Radio Broadcasting                            |
| <b>Week 3</b> | Need for Modulation,                                                                         |
| <b>Week 4</b> | Methods of Modulation:                                                                       |
| <b>Week 5</b> | Amplitude Modulation<br>Percent Modulation, Upper and Lower Sidebands,                       |

|                |                                                                                                                                                                 |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 6</b>  | Mathematical Analysis of a Modulated Carrier Wave. Power Relation in an AM Wave,                                                                                |
| <b>Week 7</b>  | <b>Midterm Exam</b>                                                                                                                                             |
| <b>Week 8</b>  | Modulating Amplifier Circuit: AM- Transmitter                                                                                                                   |
| <b>Week 9</b>  | Radio Receiver Essential Parameter                                                                                                                              |
| <b>Week 10</b> | Generation of SSB, DSB-SC Balanced Modulators :(Cowan & Ring )<br>Demodulation of AM Signal: AM-Detector (Envelope & Synchronous                                |
| <b>Week 11</b> | Frequency Modulation: Modulation Index, Deviation Ratio , Percent Modulation, FM Side bands<br>FM Receiver :FM Discriminator (Foster –Seeley & Ratio Detector), |
| <b>Week 12</b> | Modulation Index and Number of Side bands,<br>Demodulation or Detection, Comparison between AM and FM, The Four Fields of FM                                    |
| <b>Week 13</b> | FM Generation (Direct & Indirect Method)                                                                                                                        |
| <b>Week 14</b> | Phase modulation (PM) Definition                                                                                                                                |
| <b>Week 15</b> | PM equation and PM wave forms                                                                                                                                   |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | <b>Material Covered</b>                                            |
|---------------|--------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Methods of Modulation Process and why modulation            |
| <b>Week 2</b> | Lab2: Demodulation methods Process and detection.                  |
| <b>Week 3</b> | Lab 3: Methods of Amplitude Modulation                             |
| <b>Week 4</b> | Lab4: Calculating the time and a frequency of carrier wave         |
| <b>Week 5</b> | Lab 5: Calculating of Index Modulation AM and Percent Modulation.  |
| <b>Week 6</b> | Lab 6: Calculating of Upper and Lower Side bands frequencies of AM |
| <b>Week 7</b> | Lab 7: Modulation AM wave.                                         |
| <b>Week 8</b> | Lab 8: Calculating power content of AM                             |



|                |                                                       |
|----------------|-------------------------------------------------------|
| <b>Week 9</b>  | Lab 9: DE-modulation wave of AM                       |
| <b>Week 10</b> | Lab 10: Frequency modulation Process                  |
| <b>Week 11</b> | Lab 11: Calculating the maximum and minimum frequency |
| <b>Week 12</b> | Lab 12: Calculating carrier frequency of FM           |
| <b>Week 13</b> | Lab 13: Index Modulation and Percent Modulation of FM |
| <b>Week 14</b> | Lab 14: Modulation wave of FM                         |
| <b>Week 15</b> | Lab 15: De-Modulation wave of FM                      |

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

|                          | Text                                                                                                                                           | Available in the Library? |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Principles of Communication Systems By J.S.Chitode, First Edition-2007<br>Modern Digital and Analog Communication Systems ,By B.P.Lathi OXFORD | Yes                       |
| <b>Recommended Texts</b> | Analog and Digital Communications, By Schaum Second Edition<br>Data Communications and Networking, By Behrouz A. Forouzan, Fifth Edition       | No                        |
| <b>Websites</b>          |                                                                                                                                                |                           |

### Grading Scheme

#### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |                             |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |                             |
| Module Title                       | Electronic Circuits     |                               | Module Delivery                                                                                                                                                                                                                          |                             |
| Module Type                        | Core                    |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                             |
| Module Code                        | CET2205                 |                               |                                                                                                                                                                                                                                          |                             |
| ECTS Credits                       | 5                       |                               |                                                                                                                                                                                                                                          |                             |
| SWL (hr/sem)                       | 125                     |                               |                                                                                                                                                                                                                                          |                             |
| Module Level                       | 2                       | Semester of Delivery          |                                                                                                                                                                                                                                          | 4                           |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |                             |
| Module Leader                      | Kadhim Sameer Ibrahim   |                               | e-mail                                                                                                                                                                                                                                   | khadum.sameer@altuff.edu.iq |
| Module Leader's Acad. Title        | lecturer                | Module Leader's Qualification | MSc.                                                                                                                                                                                                                                     |                             |
| Module Tutor                       |                         |                               | e-mail                                                                                                                                                                                                                                   |                             |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein |                               | e-mail                                                                                                                                                                                                                                   | osama.abbas@mtu.edu.iq      |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |                             |

| Relation with other Modules       |         |          |   |
|-----------------------------------|---------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |         |          |   |
| Prerequisite module               | CET2104 | Semester | 3 |
| Co-requisites module              | None    | Semester |   |

### Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>62. This course deals with Third semiconductor or device, FET physical construction, biasing, configuration s , output and transfer characteristics</p> <p>63. To understand the D.C biasing of BJT and circuit types , analysis and calculations of FET parameters</p> <p>64. To understand and construct re FET modeling, and circuits analysis</p> <p>65. To deal with small signal analysis of FET</p> <p>66. Deals with Depletion-Type MOSFET , and Enhancement-Type MOSFETs and Combination ,and Design</p> <p>6. Deals with Operational amplifiers (OP_AMP) their advantages, classifications and types and application circuits</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>109. To understand and discuss the third semiconductor device which is Transistor (Field Effect Transistor)(FET), Construction and Characteristics of JFETs</p> <p>110. To Identify and Calculate And implement Transfer Characteristics of FET</p> <p>111. To Identify and discuss Important Relationships 227 5.7 Depletion-Type MOSFET 228 5.8 Enhancement-Type MOSFET , MOSFET Handling , VMOS CMOS</p> <p>112. To implement and solve FET DC biasing and circuits analysis Fixed-Bias Configuration Self-Bias Configuration Voltage-Divider Biasing, implementations</p> <p>113. To understand Depletion-Type MOSFETs Enhancement-Type MOSFETs</p> <p>114. To identify and implement Combination Networks , Design P-Channel FETs Universal JFET Bias Curve .</p> <p>115. To understand FET small signal Model,</p> <p>116. To Identify, Calculate and analyses JFET Fixed-Bias Configuration , JFET Self-Bias Configuration , JFET Voltage-Divider Configuration ,</p> <p>117. To understand JFET Source-Follower (Common-Drain) Configuration , JFET Common-Gate Configuration ,</p> <p>118. To identify Depletion-Type MOSFETs, Enhancement-Type MOSFETs E-MOSFET Drain-Feedback Configuration,</p> <p>119. To Understand and implement E-MOSFET Voltage-Divider Configuration, Designing FET Amplifier Networks.</p> <p>120. To understand and identify Operational amplifiers (Introduction) , Differential and Common-Mode Operation</p> <p>121. To understand Op-Amp, Practical Op-Amp Circuits , and Op-Amp Specifications</p> <p>122. To identify DC Offset Parameters, Op-Amp Specifications and Frequency Parameters</p> |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p>123. To understand and identify OP AMP applications circuits.</p> <p>124. To Analyze, calculate and implement Constant-Gain Multiplier, Voltage Summing , Voltage Buffer, Controller Sources Instrumentation Circuits ,and Active Filters</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p>1. FET (Field Effect Transistor) (FET), Construction and Characteristics of JFETs, Transfer_Characteristics of FET , Important Relationships Depletion-Type MOSFET Enhancement-Type MOSFET , MOSFET Handling , VMOS CMOS [8hrs] .</p> <p>FET D.C. biasing and circuits analysis Fixed-Bias Configuration, Self-Bias Configuration , and Voltage-Divider Biasing, implementations [8 hrs]</p> <p>Depletion-Type MOSFETs Enhancement-Type MOSFETs, Combination Networks , Design, and P-Channel FETs Universal JFET Bias Curve [10hrs].</p> <p>FET small signal Model, JFET Fixed-Bias Configuration , JFET Self-Bias Configuration , JFET Voltage-Divider Configuration [8hrs].</p> <p>JFET Source-Follower (Common-Drain) Configuration , JFET Common-Gate Configuration , Depletion-Type MOSFETs , Enhancement-Type MOSFETs E-MOSFET Drain-Feedback Configuration, Voltage-Divider Configuration ,and Designing FET Amplifier Networks . [12hrs]</p> <p>2. Operational amplifiers (OP_AMPS)</p> <p>Operational amplifiers (Introduction) , Differential and Common-Mode Operation Op-Amp introduction , Practical Op-Amp Circuits , and Op-Amp Specifications DC Offset Parameters , Op-Amp Specifications and Frequency Parameters [8 hrs]</p> <p>OP AMP applications circuits Constant-Gain Multiplier , Voltage Summing , Voltage Buffer, Controller Sources Instrumentation Circuits ,and Active Filters[6 hrs]</p> |
|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| <p><b>Learning and Teaching Strategies</b><br/>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                       | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |

| Student Workload (SWL)<br>الحمل الدراسي للطالب موزع على (15) اسبوع             |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| Module Evaluation<br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|--------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                            |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                       | Quizzes         | 2           | 10% (10)         | 5, 10,     | LO # 1-6 , LO # 6-11      |
|                                            | Assignments     | 2           | 10% (10)         | 5, 10      | LO # 1-4, LO # 5-9        |
|                                            | Projects / Lab. | 1           | 10% (10)         | Continuous |                           |
|                                            | Report          | 1           | 10% (10)         | 13         | LO # 1-12                 |
| Summative assessment                       | Midterm Exam    | 2 hr        | 10% (10)         | 9          | LO #1-10                  |
|                                            | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment                           |                 |             | 100% (100 Marks) |            |                           |

**Delivery Plan (Weekly Syllabus)**

## المنهاج الاسبوعي النظري

|                | Material Covered                                                                                                  |
|----------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction ,Field effect transistor FET, Introduction , CONSTRUCTION AND CHARACTERISTICS                        |
| <b>Week 2</b>  | TRANSFER CHARACTERISTICS, Applying Shockley's Equation, and short hand method                                     |
| <b>Week 3</b>  | DEPLETION-TYPE MOSFET, Basic Construction, c Operation and Characteristics                                        |
| <b>Week 4</b>  | p-Channel Depletion-Type MOSFET, ENHANCEMENT-TYPE MOSFET, Basic construction                                      |
| <b>Week 5</b>  | Enhancement MOSEFET Basic Operation and Characteristics, MOSFET HANDLING                                          |
| <b>Week 6</b>  | FET DC. Biasing , FIXED-BIAS CONFIGURATION,                                                                       |
| <b>Week 7</b>  | FET SELF-BIAS CONFIGURATION, VOLTAGE-DIVIDER BIASING                                                              |
| <b>Week 8</b>  | DEPLETION-TYPE MOSFETs, ENHANCEMENT-TYPE MOSFETs. DESIGN                                                          |
| <b>Week 9</b>  | <b>Midterm Exam</b>                                                                                               |
| <b>Week 10</b> | FET SMALL-SIGNAL MODEL, Graphical Determination of gm, Mathematical Definition of gm                              |
| <b>Week 11</b> | FET AC Equivalent Circuit, JFET VOLTAGE-DIVIDER CONFIGURATION, JFET SOURCE-FOLLOWER (COMMON-DRAIN) CONFIGURATION, |
| <b>Week 12</b> | JFET COMMON-GATE CONFIGURATION, DEPLETION-TYPE MOSFETs, ENHANCEMENT-TYPE MOSFETs                                  |
| <b>Week 13</b> | Operational amplifier, DIFFERENTIAL AND COMMONMODE OPERATIO, OP-AMP BASICS                                        |
| <b>Week 14</b> | Operational amplifier applications                                                                                |
| <b>Week 15</b> | Operational amplifier applications                                                                                |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                     |

**Delivery Plan (Weekly Lab. Syllabus)**

## المنهاج الاسبوعي للمختبر

|               | Material Covered                        |
|---------------|-----------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction                     |
| <b>Week 2</b> | Lab 2: Clampers                         |
| <b>Week 3</b> | Lab 3 Input characteristic of CBC BJT   |
| <b>Week 4</b> | Lab 4 output characteristic of CBC BJT  |
| <b>Week 5</b> | Lab 5: Input characteristic of CEC BJT  |
| <b>Week 6</b> | Lab 6: output characteristic of CEC BJT |
| <b>Week 7</b> | Lab 7:review                            |

| Learning and Teaching Resources |                                                 |                           |
|---------------------------------|-------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                 |                           |
|                                 | Text                                            | Available in the Library? |
| Required Texts                  | Electronic devices and circuit theory Poylested | Yes                       |
| Recommended Texts               |                                                 | No                        |
| Websites                        |                                                 |                           |

| Grading Scheme              |                  |                     |           |                                       |
|-----------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                |                  |                     |           |                                       |
| Group                       | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100) | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                             | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                             | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                             | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                             | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)      | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                             | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                             |                  |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                 |                               |                                                                                                                                                                                                                                          |
|------------------------------------|---------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                 |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Instrumentation and Measurement |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                            |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET2206                         |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 4                               |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 100                             |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 2                               | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                             | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Kadhim Sameer Ibrahim           | e-mail                        | khadum.sameer@altuff.edu.iq                                                                                                                                                                                                              |
| Module Leader's Acad. Title        | Asst. lec.                      | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                                    |
| Module Tutor                       |                                 | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Alhamzah Taher Mohammed         | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval Date | 29/10/2023                      | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

### Module Aims, Learning Outcomes and Indicative Contents



| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 67. Identify and analyze factors affecting the performance of measuring systems and errors types and cause<br>68. Understand voltage and current measurements from a given circuit.<br>69. Choose appropriate instruments for the measurement of voltage, and current in ac and dc measurements<br>70. Describe the operating principle of DC and AC bridges<br>71. Identify Oscilloscopes, signal generators, and transducers                                                                                                                                                                                                                                                                                                                                   |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 125. Explain the static characteristics of measuring systems.<br>126. Discuss problems related to measurement errors.<br>127. Explain the construction and working indicating Instruments.<br>128. Explain the principle of operation of the galvanometer.<br>129. Discuss the DC bridges- Wheatstone Bridge, Kelvin Bridge<br>130. Discuss the AC bridges, Capacitance Comparison Bridges, Maxwell's Bridge, Wein's bridge<br>131. Explain the Design of DC voltmeter and ammeter.<br>132. Describe Cathode Ray Tube Oscilloscope.<br>133. Identify High Bandwidth Digital Storage Oscilloscope.<br>134. Identify Spectrum Analyzer and BER Tester<br>135. Discuss Signal Generator.<br>136. Identify Arbitrary Waveform Generator<br>137. Explain Transducers. |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | Indicative content includes the following.<br><br><u>Part A – Measurement and Error Analysis</u><br><br>Basics of Measurements, Accuracy, Precision, Resolution, Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution, and significant figures, standard of measurements [24 hrs.]<br><br><u>Part B – Measuring Instruments</u><br>Measurement of resistance, inductance, and capacitance Whetstone's Bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's Bridge, Wein's Bridge, [9 hrs].<br><br><b>Voltmeters and Ammeters Introduction</b> , voltmeter, Multirange voltmeter, ammeter, Multirange ammeter Extending voltmeter and ammeter ranges [11hrs]                                  |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Introduction Oscilloscopes, Basic principles, CRT features, Block diagram and working of each block High Bandwidth Digital Storage Oscilloscope-Spectrum Analyzer -BER Tester [8 hrs]</p> <p>Introduction Signal Generators, Fixed and variable AF oscillator, Standard signal generator Arbitrary Waveform Generator. [4 hrs]</p> <p>Introduction Transducers, Electrical transducers, Selecting a transducer, Resistive transducer [2 hrs]</p> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>lecture and seminars will be used to explain the theory and principles of the module. Also, laboratory reports and mini-projects will be used. Quantitative instruments such as pre-test and post-test will be used to check students' conceptual knowledge of electrical measurement after the theory lecture or laboratories work. Video will be used to explain the electrical measurement instruments. Observation form and laboratory rubric will be used to analyze the skills of the students. The observer comments from the laboratory staff on student skills will be classified according to thematic analysis to evaluate students learned skills.</p> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 36  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 2.4  |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                            |      |

### Module Evaluation

| تقييم المادة الدراسية |                |             |                  |            |                           |
|-----------------------|----------------|-------------|------------------|------------|---------------------------|
|                       |                | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes        | 2           | 10% (5)          | 3, 12      | LO #1, 2, LO # 3-11       |
|                       | Assignments    | 2           | 10% (5)          | 5, 10      | LO # 1-4, LO # 5-9        |
|                       | Project / Lab. | 1           | 10% (10)         | Continuous |                           |
|                       | Report         | 1           | 10% (10)         | 13         | LO # 1- 12                |
| Summative assessment  | Midterm Exam   | 2 hr        | 10% (20)         | 9          | LO # 1-7                  |
|                       | Final Exam     | 4 hr        | 50% (50)         | 16         | All                       |
| Total assessment      |                |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                             |
|---------------------------------|-----------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                             |
|                                 | Material Covered                                                            |
| Week 1                          | Introduction - System of Units- Basics of Measurements                      |
| Week 2                          | Accuracy, Precision, Resolution                                             |
| Week 3                          | Reliability, Repeatability, Validity                                        |
| Week 4                          | Types of Errors                                                             |
| Week 5                          | Errors analysis                                                             |
| Week 6                          | Standard of Measurements                                                    |
| Week 7                          | Bridge Measurement .DC bridges- Wheatstone Bridge, Kelvin Bridge            |
| Week 8                          | AC bridges, Capacitance Comparison Bridges, Maxwell's Bridge, Wein's bridge |
| Week 9                          | Midterm Exam                                                                |
| Week 10                         | Measuring of Basic Electrical Parameters- DC Voltmeter                      |
| Week 11                         | DC Ammeter- Extension of DC Voltmeter and Ammeter Range                     |
| Week 12                         | Cathode Ray Tube Oscilloscope                                               |
| Week 13                         | High Bandwidth Digital Storage Oscilloscope- Spectrum Analyzer -BER Tester  |
| Week 14                         | Signal Generator - Arbitrary Waveform Generator                             |
| Week 15                         | Transducers                                                                 |

**Delivery Plan (Weekly Lab. Syllabus)**

المنهاج الاسبوعي للمختبر

|                | Material Covered                                                  |
|----------------|-------------------------------------------------------------------|
| <b>Week 1</b>  | Lab 1: Introduction to Galvanometer – sensitivity of Galvanometer |
| <b>Week 2</b>  | Lab 2: measurement of DC current                                  |
| <b>Week 3</b>  | Lab 3: measurement of DC voltage                                  |
| <b>Week 4</b>  | Lab 4: measurement of AC current                                  |
| <b>Week 5</b>  | Lab 5: measurement of AC Voltage                                  |
| <b>Week 6</b>  | Lab 6: loading effect on the voltmeter                            |
| <b>Week 7</b>  | Lab 7: Wheatstone Bridge                                          |
| <b>Week 8</b>  | Lab 8: Maxwell's Bridge                                           |
| <b>Week 9</b>  | Lab 9: <b>Mid-term Exam</b>                                       |
| <b>Week 10</b> | Lab 10: DC Voltmeter Design                                       |
| <b>Week 11</b> | Lab 11: DC Ammeter Design                                         |
| <b>Week 12</b> | Lab 12: Oscilloscope and frequency measurement                    |
| <b>Week 13</b> | Lab 13: Project Discussion                                        |
| <b>Week 14</b> | Lab 14: A preparatory week before the Final Exam                  |
| <b>Week 15</b> | Lab 15: <b>Final Exam</b>                                         |

**Learning and Teaching Resources**

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                  | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | <b>Electronic Instrumentation and Measurements</b> , David A Bell, PHI / Pearson Education.                                                                                           | Yes                       |
| <b>Recommended Texts</b> | <b>"Principles of measurement systems"</b> , John P. Beately, Pearson Education.<br><b>Modern electronic instrumentation and measuring techniques"</b> , Cooper D & A D Helfrick, PHI | No                        |
| <b>Websites</b>          |                                                                                                                                                                                       |                           |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                     | معلومات المادة الدراسية       |                                                                                                                                                                                                                                          |
|------------------------------------|---------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module Title                       | Arabic Language (2) |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Basic               |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | MTU1009             |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 2                   |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 50                  |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 2                   | Semester of Delivery          | 2                                                                                                                                                                                                                                        |
| Administering Department           | CET                 | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Dr. Salim Hashim    |                               | e-mail: dr.salim@altuff.edu.iq                                                                                                                                                                                                           |
| Module Leader's Acad. Title        | Lec.                | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |
| Module Tutor                       |                     | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Ahmed J. Abid       | e-mail                        | dr.ahmedjabbar@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 15/10/2024          | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules |      | العلاقة مع المواد الدراسية الأخرى |  |
|-----------------------------|------|-----------------------------------|--|
| Prerequisite module         | None | Semester                          |  |
| Co-requisites module        | None | Semester                          |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Module Aims<br>أهداف المادة الدراسية                     | <p>أهداف المادة الدراسية هي اني يكون الطالب قادراً على أن:</p> <p>15. يتعرف على ماهية التعبير القرآني.</p> <p>16. يتعلم القواعد النحوية المستعملة في التعبير القرآني، والأثر البلاغي والفني الذي يترتب على كيفية التعبير القرآني، وأن يفهم الطالب كيفية التحليل للنصوص القرآنية.</p> <p>17. يتعرف على شخصية من أهم شخصيات الأدب والشعر العربي والعراقي، بدر شاكر السياب، ومعرفة شعره.</p> <p>18. يتعرف على علامات الإعراب الأصلية والفرعية، ويتعلم استعمالها في اللغة العربية، ويفهم الفرق بين علامات الإعراب الفرعية والأصلية.</p> <p>19. يتعلم الفرق بين الجمل الأسمية والفعلية، ويتعرف على أنواع المبتدأ، وأنواع الخبر، ويفهم الفرق</p> |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>بينهما .</p> <p>20. يتعرف على إن وأخواتها ، ويتعلم القواعد الخاصة بها.</p> <p>21. يفهم الفرق بين إنَّ وأنَّ، وأنَّ وأنَّ ، ويطبق ذلك عند استعمال كل منها في النصوص.</p> <p>22. يتعرف على كان وأخواتها ، ويتعلم عمل كل منها في اللغة ، ويتمكن من استعمالها الصحيح في اللغة .</p> <p>23. يتعرف على عمل الأفعال الخمسة ، وعلامات إعرابها ، ويستطيع استعمالها بشكل صحيح في الخطاب ، أو النص.</p> <p>24. يتعرف على الأخطاء اللغوية ، ويتعلم تجنبها أثناء الكتابة.</p> <p>25. يدرس معلومات لغوية : الأضداد والمرادفات ، والفرق اللغوية ، والمعاملات النحوية ، ويفهم الفرق بينها ، ويتمكن من تحليلها .</p> <p>26. يتعلم إعراب المثنى .</p> <p>27. يتعرف على أنواع الجموع، ويتعلم التفريق بينها ، ويفهم كيفية إعرابها.</p> <p>28. يتعلم كيفية كتابة قواعد اللغة العربية في لوحة بيانية ، ويتمكن من تصويب الأخطاء اللغوية .</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p><b>مخرجات التعلم للمادة الدراسية هي:</b></p> <p>14. قدرة الطالب على فهم التعبير القرآني ، وتحليل النصوص.</p> <p>15. القدرة على استخدام القواعد النحوية ، وفهم الأساليب البلاغية والقدرة على استعمالها.</p> <p>16. معرفة الطالب لشخصية الشاعر والأديب بدر شاكر السياب ، وأهم أشعاره وآثاره.</p> <p>17. القدرة على التمييز بين علامات الإعراب الأصلية والفرعية ، والقدرة على استعمالها في الخطاب ، أو النص.</p> <p>18. قدرة الطالب على التمييز بين الجمل الأسمية والفعلية ، وقدرته على التمييز بين أنواع المبتدأ، والخبر ، وكيفية استعمال الجمل وإعرابها.</p> <p>19. فهم الطالب لعمل إنَّ وأخواتها ، وقدرته على استعمالها بشكل صحيح في الجمل.</p> <p>20. القدرة على التفريق بين أنَّ وإنَّ، وإنَّ وإنَّ، واستعمالها في مواضعها الصحيحة في النصوص.</p> <p>21. القدرة على فهم عمل كان وأخواتها ، واستعمالها بشكل صحيح.</p> <p>22. التمكن من معرفة وأعراب الأفعال الخمسة ، وكيفية استعمالها في الجمل.</p> <p>23. القدرة على معرفة وتجنب الأخطاء اللغوية عند الكتابة.</p> <p>24. معرفة إعراب المثنى .</p> <p>25. القدرة على التمييز بين الجموع ، وكيفية إعرابها ، واستعمالها في الجمل.</p> <p>26. معرفة الطالب لمعلومات لغوية : المرادفات. والأضداد ، والفرق اللغوية ، والمعادلات النحوية ، والقدرة على استخراجها ، أو استعمالها في الجمل.</p>                    |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p><b>المحتويات الإرشادية في مادة اللغة تشمل مجموعة من المفاهيم والمواضيع التي يتم تغطيتها خلال عملية التعلم. ومن بين المحتويات الإرشادية المهمة:</b></p> <p>13. مقدمة عن التعبير القرآني، وتعريف بالإعجاز اللغوي في آيات القرآن الكريم وجمالية اللغة العربية وبلاغتها. ( 4 ساعات)</p> <p>14. التعريف بشخصية الشاعر الكبير بدر شاكر السياب ، وأهمية شعره في الأدب العربي والعراقي. ( 4 ساعات)</p> <p>15. دراسة علامات الإعراب ، بنوعها ، وكيفية الأعراب . ( 4 ساعات)</p> <p>16. دراسة الجمل الأسمية والفعلية ، وتعلم التفريق بين الأنواع المبتدأ ، وأنواع الخبر. ( 4 ساعات)</p> <p>17. دراسة إن وأخواتها ، وكيفية عملها وأعرابها . ( 4 ساعات)</p> <p>18. دراسة الفرق بين إنَّ وأنَّ، وإنَّ وأنَّ، وكيفية عملها وأعرابها. ( 4 ساعات)</p> <p>19. دراسة كان وأخواتها ، وكيفية عملها وإعرابها. ( 4 ساعات)</p> <p>20. التعريف بالأفعال الخمسة ، وعملها وإعرابها.. ( 4 ساعات)</p> <p>21. دراسة الأخطاء اللغوية الشائعة وتطبيقاتها في النصوص. ( 4 ساعات)</p> <p>22. تعلم المعلومات اللغوية : الأضداد والمترادفات، والفروق اللغوية ، والمعادلات النحوية. ( 3 ساعات)</p> <p>23. دراسة المثنى وأعرابه. (3 ساعات)</p> <p>24. دراسة الجموع ، وأنواعها وإعرابها. ( 3 ساعات)</p> <p>25. دراسة القواعد النحوية وكتابتها في رسم بياني ، وتصويب الأخطاء اللغوية. ( 3 ساعات)</p> |
| <p><b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم</p>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><b>Strategies</b></p>                                                    | <p>استراتيجيات التعلم والتعليم المستخدمة في مادة اللغة تشمل مجموعة متنوعة من النهج والتقنيات التي تعزز</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|  |                                                                                                                                                                                                                      |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | عملية التعلم للطلاب. من بين هذه الاستراتيجيات:                                                                                                                                                                       |
|  | 9. التفاعل النشط: يتم تشجيع الطلاب على المشاركة والمشاركة الفعالة في الدروس من خلال المناقشات الجماعية والأنشطة التفاعلية.                                                                                           |
|  | 10. التعلم التعاوني: يشجع التعاون والتعاون بين الطلاب من خلال العمل الجماعي والمشاريع الجماعية، حيث يتعاون الطلاب مع بعضهم البعض لتحقيق أهداف التعلم المحددة.                                                        |
|  | 11. التطبيق العملي: يتم توفير فرص للطلاب لتطبيق المفاهيم والمهارات المكتسبة في سياقات عملية وواقعية، مما يعزز التفاعل الفعال مع المادة.                                                                              |
|  | 12. استخدام التقنيات الحديثة: يستفيد الطلاب من استخدام التكنولوجيا في عملية التعلم، مثل استخدام الحواسيب والإنترنت للبحث والتعلم الذاتي.                                                                             |
|  | 13. توفير ردود فعل فورية: يتم توفير ردود فعل فورية وتقييم مستمر للطلاب، سواء عن طريق التقييمات الشفهية أو الكتابية، مما يساعدهم على تحسين أدائهم وتطوير مهاراتهم.                                                    |
|  | 14. التنوع في وسائل التواصل: يتم استخدام مجموعة متنوعة من وسائل التواصل والتعليم، مثل المحاضرات التوضيحية، والمناقشات الجماعية، والأنشطة العملية، والعروض التقديمية، لتلبية احتياجات وأساليب التعلم المختلفة للطلاب. |
|  | 15. باستخدام هذه الاستراتيجيات، يتم تعزيز التفاعل والتعلم الفعال للطلاب، و                                                                                                                                           |
|  | 16. تحفيزهم على المشاركة واكتساب المعرفة والمهارات بشكل شامل وشيق.                                                                                                                                                   |
|  |                                                                                                                                                                                                                      |
|  |                                                                                                                                                                                                                      |
|  |                                                                                                                                                                                                                      |
|  |                                                                                                                                                                                                                      |
|  |                                                                                                                                                                                                                      |
|  |                                                                                                                                                                                                                      |
|  |                                                                                                                                                                                                                      |

| Student Workload (SWL) الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا          |    |                                                                    |   |
|-------------------------------------------------------------------------|----|--------------------------------------------------------------------|---|
| Structured SWL (h/sem)<br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 33 | Structured SWL (h/w)<br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 2 |
| Unstructured SWL (h/sem)<br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 17 | Unstructured SWL (h/w)<br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 1 |
| Total SWL (h/sem)<br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 50 |                                                                    |   |

| Module Evaluation<br>تقييم المادة الدراسية |                 |                 |                     |             |                              |
|--------------------------------------------|-----------------|-----------------|---------------------|-------------|------------------------------|
|                                            |                 | Time/<br>Number | Weight (Marks)      | Week<br>Due | Relevant Learning<br>Outcome |
| Formative<br>Assessment                    | Quizzes         | 3               | 15% (15)            | 5, 10, 13   | LO #1, 5, and 11             |
|                                            | Assignments     | 3               | 15% (15)            | 2, 11, 14   | LO # 3, 6 and 12             |
|                                            | Projects / Lab. |                 |                     |             |                              |
|                                            | Report          | 1               | 10% (10)            | 14          | LO # 1-13                    |
| Summative<br>Assessment                    | Midterm Exam    | 2 hours         | 10% (10)            | 7           | LO # 1-7                     |
|                                            | Final Exam      | 3 hours         | 50% (50)            | 16          | All                          |
| Total assessment                           |                 |                 | 100%<br>(100 Marks) |             |                              |

| المنهاج الاسبوعي النظري<br>Delivery Plan (Weekly Syllabus) |                                                                                                                                                    |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| الأسبوع الأول ، والثاني                                    | التعبير القرآني، نحويًا من حيث تركيب الجملة والنص. بلاغيا من حيث التأثير الفني، والرجوع إلى المصدر (كتاب التعبير القرآني) للدكتور فاضل السامرائي . |
| الاسبوع الثالث                                             | الشاعر بدر شاكر السياب.                                                                                                                            |
| الأسبوع الرابع                                             | علامات الإعراب الأصلية: (الفتحة والضمة، والكسرة)، وعلامات الإعراب الفرعية: (الألف، والواو،                                                         |



|                                                                    |                                |
|--------------------------------------------------------------------|--------------------------------|
| والياء ).                                                          |                                |
| الجملة الاسمية – المبتدأ والخبر ، وأنواع المبتدأ ، وأنواع الخبر.   | الأسبوع الخامس                 |
| أن وأخواتها                                                        | الأسبوع السادس                 |
| الفرق بين إنَّ وأنَّ ، وأنَّ وإنَّ.                                | الأسبوع السابع                 |
| كان وأخواتها.                                                      | الأسبوع الثامن                 |
| الأفعال الخمسة .                                                   | الأسبوع التاسع والعاشر         |
| الأخطاء اللغوية الجزء (2)                                          | الاسبوع الحادي عشر             |
| معلومات لغوية : المرادفات والاضداد، وفروق لغوية. ومعادلات نحوية.   | الاسبوع الثاني عشر             |
| المثنى وإعرابه.                                                    | الأسبوع الثالث عشر والرابع عشر |
| أنواع الجموع : جمع المذكر السالم- جمع المؤنث السالم- جمع التذكير . | الأسبوع الخامس عشر             |
| هندسة النحو: قواعد اللغة العربية في لوحة تعليمية ، وتصويبات لغوية  | الأسبوع السادس عشر             |

| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                        |                           |
|----------------------------------------------------------|------------------------------------------------------------------------|---------------------------|
|                                                          | Text                                                                   | Available in the Library? |
| Required Texts                                           | • ملزمة اللغة العربية ( المعممة من وزارة التعليم العالي والبحث العلمي) | Yes                       |
| Recommended Texts                                        | • التعبير القرآني للدكتور فاضل السامرائي.                              | No                        |
| Websites                                                 | The Collage E-Library                                                  |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 - 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                            |                               |                                                                                                                                                                                                                                          |                          |
|------------------------------------|----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| معلومات المادة الدراسية            |                            |                               |                                                                                                                                                                                                                                          |                          |
| Module Title                       | Operating Systems          |                               | Module Delivery                                                                                                                                                                                                                          |                          |
| Module Type                        | Core                       |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                          |
| Module Code                        | CET3101                    |                               |                                                                                                                                                                                                                                          |                          |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                          |                          |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                          |                          |
| Module Level                       | 3                          | Semester of Delivery          |                                                                                                                                                                                                                                          | 5                        |
| Administering Department           | CET                        | College                       | EETC                                                                                                                                                                                                                                     |                          |
| Module Leader                      | Ali Almimar                |                               | e-mail                                                                                                                                                                                                                                   | alialmimar@altuff.edu.iq |
| Module Leader's Acad. Title        | Asst. Lec.                 | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |                          |
| Module Tutor                       |                            |                               | e-mail                                                                                                                                                                                                                                   |                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |                          |
| Scientific Committee Approval Date | 29/10/2023                 | Version Number                | 1.0                                                                                                                                                                                                                                      |                          |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>1. This course includes the basic concepts of operating system components.</li> <li>2. To develop problem-solving skills and understand process management, deadlocks, and synchronization.</li> <li>3. To understand consists of memory management techniques.</li> <li>4. This course deals with File system implementation.</li> <li>5. It also includes a case study on the Linux operating system.</li> <li>6. To understand the I/O device management principles.</li> <li>7. To perform the disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK), and Disk Formatting.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>138. Should understand: hardware components that must be managed by an operating system.</li> <li>139. Describe need and role of operating system.</li> <li>140. The concept of a process, the process life cycle, process states and state transitions, process control blocks (PCBs)/process descriptors.</li> <li>141. How processors transition between processes via context switching. How interrupts enable hardware to communicate with software. How processes converse with one another via interprocess communication (IPC).</li> <li>142. The motivation for creating threads. The similarities and differences between processes and threads. The various levels of support for threads. The life cycle of a thread. Thread signaling and cancellation.</li> <li>143. The challenges of synchronizing concurrent processes and threads. Critical sections and the need for mutual exclusion. how to implement mutual exclusion primitives in software</li> <li>144. How monitors synchronize access to data. How condition variables are used with monitors. Solutions for classic problems in concurrent programming such as readers and writers and circular buffer.</li> <li>145. The problem of deadlock. The four necessary conditions for deadlock to exist. The problem of indefinite postponement. The notions of deadlock prevention, avoidance, detection and recovery.</li> <li>146. Understand OS components such a scheduler, memory manager, file</li> <li>147. System handlers and I/O device managers.</li> <li>148. Analyze and criticize techniques used in OS components</li> <li>149. Demonstrate and simulate algorithms used in OS components</li> <li>150. Identify algorithms and techniques used in different components of Linux</li> </ol> |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   |                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | <b>1. Operating System Overview teaching hours: 10 hrs</b><br><b>2. Process Management teaching hours: 10 hrs</b><br><b>3. Process Deadlocks teaching hours: 10 hrs</b><br><b>4. Memory Management teaching hours: 14 hrs</b><br><b>5. File Management teaching hours: 10 hrs</b><br><b>6. Device Management teaching hours: 10 hrs</b><br><b>7. Linux Case Study teaching hours: 10 hrs</b> |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to An operating system that acts as an intermediary between the user of a computer and the computer hardware. The purpose of an operating system is to provide an environment in which a user can execute programs in a convenient and efficient manner. |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |         |                |          |                   |
|---------------------------------------------------|---------|----------------|----------|-------------------|
|                                                   | Time/Nu | Weight (Marks) | Week Due | Relevant Learning |

|                      |              | Number |                  |            | Outcome           |
|----------------------|--------------|--------|------------------|------------|-------------------|
| Formative assessment | Quizzes      | 2      | 10% (10)         | 5, 10      | LO #1-4, LO #5-9  |
|                      | Assignments  | 2      | 20% (10)         | 2, 12      | LO #1,2, LO #3-10 |
|                      | Report       | 1      | 10% (10)         | continuous |                   |
| Summative assessment | Midterm Exam | 2 hr   | 10% (10)         | 7          | LO # 1-8          |
|                      | Final Exam   | 4hr    | 50% (50)         | 16         | All               |
| Total assessment     |              |        | 100% (100 Marks) |            |                   |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|        | Material Covered                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1 | Introduction to Operating Systems Operating System Architectures, Definition, Two views of operating system, Evolution of operating system, Types of OS                                                                                                                                                                                                                                                                                             |
| Week 2 | System Call, Handling System Calls, System Programs, Operating System Structures, The Shell, Open Source Operating Systems                                                                                                                                                                                                                                                                                                                          |
| Week 3 | Process vs Program, Multiprogramming, Process Model, Process States, Process Control Block. Threads, Thread vs Process, User and Kernel Space Threads. Inter Process Communication, Race Condition, Critical Section                                                                                                                                                                                                                                |
| Week 4 | Implementing Mutual Exclusion: Mutual Exclusion with Busy Waiting (Disabling Interrupts, Lock Variables, Strict Alteration, Peterson's Solution, Test and Set Lock), Sleep and Wakeup, Semaphore, Monitors, Message Passing, Classical IPC problems: Producer Consumer, Sleeping Barber, Dining Philosopher Problem.                                                                                                                                |
| Week 5 | Process Scheduling: Goals, Batch System Scheduling (First-Come First-Served, Shortest Job First, Shortest Remaining Time Next), Interactive System Scheduling (Round-Robin Scheduling, Priority Scheduling, Multiple Queues), Overview of Real Time System Scheduling.                                                                                                                                                                              |
| Week 6 | Introduction, Deadlock Characterization, Preemptable and Non-preemptable Resources, Resource – Allocation Graph, Conditions for Deadlock.                                                                                                                                                                                                                                                                                                           |
| Week 7 | Midterm Exam                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Week 8 | Handling Deadlocks: Ostrich Algorithm, Deadlock prevention, Deadlock Avoidance, Deadlock Detection (For Single and Multiple Resource Instances), Recovery From Deadlock (Through Preemption and Rollback. Introduction, Monoprogramming vs. Multi-programming, Modelling Multiprogramming, Multiprogramming with fixed and variable partitions, Relocation and Protection. Memory management (Bitmaps & Linked-list), Memory Allocation Strategies. |
| Week 9 | Virtual memory: Paging, Page Table, Page Table Structure, Handling Page Faults, TLB's Page Replacement Algorithms: FIFO, Second Chance, LRU, Optimal, LFU, Clock, WS- Clock,                                                                                                                                                                                                                                                                        |

|                |                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 10</b> | Concept of Segmentation: Need of Segmentation, its Drawbacks, Segmentation with Paging(MULTICS).                                                                                                                                                                                                                                                                                    |
| <b>Week 11</b> | File Overview: File Naming, File Structure, File Types, File Access, File Attributes, File Operations, Single Level, two Level and Hierarchical Directory Systems, File System Layout.                                                                                                                                                                                              |
| <b>Week 12</b> | Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table in Memory, Inodes. Directory Operations, Path Names, Directory Implementation, Shared Files                                                                                                                                                                                   |
| <b>Week 13</b> | Free Space Management: Bitmaps, Linked List                                                                                                                                                                                                                                                                                                                                         |
| <b>Week 14</b> | Classification of IO devices, Controllers, Memory Mapped IO, DMA Operation, Interrupts, Goals of IO Software, Handling IO(Programmed IO, Interrupt Driven IO, IO using DMA), IO Software Layers (Interrupt Handlers, Device Drivers) . Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK), Disk Formatting (Cylinder Skew, Interleaving, Error handling), RAID. |
| <b>Week 15</b> | History, Kernel Modules, Process Management, Scheduling, Inter-process Communication, Memory Management, File System Management Approaches, Device Management Approaches.                                                                                                                                                                                                           |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                                         |
|---------------|--------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to Demonstration of basic Linux Commands             |
| <b>Week 2</b> | Lab 2: Process creation and termination, thread creation and termination |
| <b>Week 3</b> | Lab 3: Simulation of IPC techniques                                      |
| <b>Week 4</b> | Lab 4: Simulation process Scheduling algorithms                          |
| <b>Week 5</b> | Lab 5: Simulation of page replacement algorithms                         |
| <b>Week 6</b> | Lab 6: Simulation of File allocation techniques                          |
| <b>Week 7</b> | Lab 7: Simulate free space management techniques                         |
| <b>Week 8</b> | Lab 8: Simulation of disk scheduling algorithms                          |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                       | Text                                        | Available in the Library? |
|-----------------------|---------------------------------------------|---------------------------|
| <b>Required Texts</b> | Operating Systems (3rd Edition) 3rd Edition | Yes                       |

|                          |                                                                                                  |     |
|--------------------------|--------------------------------------------------------------------------------------------------|-----|
|                          | by Harvey M. Deitel (Author), Paul J. Deitel (Author), David R. Choffnes (Author)                |     |
| <b>Recommended Texts</b> | Operating System Concepts Essentials Tenth Edition Avi Silberschatz Peter Baer Galvin Greg Gagne | yes |
| <b>Websites</b>          |                                                                                                  |     |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                 |                                           |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                           |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Control Engineering Fundamentals          |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                                      |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3102                                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                                       |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                                         | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                                       | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mohammed Albaker Najm Abed                | e-mail                        | eng.mohammed.iq99@gmail.com                                                                                                                                                                                                              |
| Module Leader's Acad. Title        | Asst. Lecturer                            | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                       |                                           |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |  |
|----------------------------------------------------------|--|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |  |
| Module Aims                                              |  |



|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>أهداف المادة الدراسية</p>                                                | <p>72. To define the control systems.</p> <p>73. To develop mathematical models that accurately represent the behavior of the system</p> <p>74. To simplify the representation of a control system.</p> <p>75. To examine the system's behavior during the transient period and the steady state.</p> <p>76. To design controllers that can manipulate the system or process to achieve desired objectives.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>151. Define the control system.</p> <p>152. classify the different types of control systems.</p> <p>153. Describe a physical system in terms of differential equations</p> <p>154. Use Laplace Transform in solving differential equations of the Control System.</p> <p>155. Derive Transfer Function for describing the work of servomotors.</p> <p>156. Reduce a block diagram of multiple subsystems to a single block representing the Transfer Function of the system.</p> <p>157. Understand steady state and transient time response analysis.</p> <p>158. Find error Coefficients and steady-state error (<math>e_{ss}</math>) according to system type.</p> <p>159. Find the time response of the 1<sup>st</sup> order system.</p> <p>160. Find the time response of the 2<sup>nd</sup> order system.</p> <p>161. Understand the effect of damping ratio <math>\xi</math> on 2<sup>nd</sup> order system.</p> <p>162. Identify Transient response specifications.</p> <p>163. Define PID controllers.</p> <p>164. Reduce the effect of Steady-state error (<math>e_{ss}</math>) and settling time (<math>T_s</math>) on time response using PID controller.</p> |
|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following:</p> <p><u>Part A – Basics of Control Systems and Transfer Function</u></p> <p>Control System definitions, Classification of Control Systems, Comparison of Open Loop and Closed Loop Control Systems, Use Laplace Transform in Control System, Mathematical Modelling of Control Systems: Electrical Systems and Mechanical Systems (Translational and Rotational), Servomotors, Rules of Block diagram reduction. [24 hrs]</p> <p><u>Part B – Time Response Analysis of Control Systems</u></p> <p>Definitions: time response, transient response and steady state response, standard</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|  |                                                                                                                                                                                                                                                                                                                        |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | test inputs, steady state analysis, static error coefficient method, analysis of type 0,1 and 2 systems, transient response analysis: 1 <sup>st</sup> order and 2 <sup>nd</sup> order systems. [30 hrs]<br><br>PID controllers: PD controller, PI controller, PID controller and output derivative controller [20 hrs] |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process. |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 6, 10      | LO #1-5, LO #6-9          |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 8, 13      | LO #1-7, LO #7-10         |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous |                           |
|                             | <b>Report</b>          | 1           | 10% (10)         | 14         | LO #1-13                  |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 8          | LO # 1-7                  |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|                | Material Covered                                                          |
|----------------|---------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction – Basics of Control Systems                                  |
| <b>Week 2</b>  | Use of Laplace Transform in Control System                                |
| <b>Week 3</b>  | Mathematical Modelling of Control System: Electrical System               |
| <b>Week 4</b>  | Mathematical Modelling of Control System: Translational Mechanical System |
| <b>Week 5</b>  | Mathematical Modelling of Control System: Rotational Mechanical System    |
| <b>Week 6</b>  | Servomotors                                                               |
| <b>Week 7</b>  | Block Diagram Reduction                                                   |
| <b>Week 8</b>  | Mid-term Exam                                                             |
| <b>Week 9</b>  | Time Response Analysis of Control Systems                                 |
| <b>Week 10</b> | Analysis of Type 0, 1, and 2 systems                                      |
| <b>Week 11</b> | Transient Response Analysis                                               |
| <b>Week 12</b> | Analysis of 2 <sup>nd</sup> order system                                  |
| <b>Week 13</b> | Transient response specifications                                         |
| <b>Week 14</b> | PID controllers                                                           |
| <b>Week 15</b> | Rate feedback controller                                                  |

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

|               | Material Covered                                                                                     |
|---------------|------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to MATLAB Simulink                                                               |
| <b>Week 2</b> | Lab 2: Laplace Transform / Verifying Algebraic functions                                             |
| <b>Week 3</b> | Lab 3: Laplace Transform / Verifying Sine functions                                                  |
| <b>Week 4</b> | Lab 4: Block Diagram Reduction                                                                       |
| <b>Week 5</b> | Lab 5: Steady State Error                                                                            |
| <b>Week 6</b> | Lab 6: 1 <sup>st</sup> Order System                                                                  |
| <b>Week 7</b> | Lab 7: 2 <sup>nd</sup> Order System                                                                  |
| <b>Week 8</b> | Lab 8: Proportional Controller/ P Controller Used in Closed-Loop DC Servo Motor Speed Control System |

|                         |                                                                                                         |
|-------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Week 9</b>           | Lab 9: Proportional Controller/ P Controller Used in Closed-Loop DC Servo Motor Position Control System |
| <b>Week 10</b>          | Lab 10: Integral Controller/ I Controller Used in Closed-Loop DC Servo Motor Speed Control System       |
| <b>Week 11</b>          | Lab 11: Integral Controller/ I Controller Used in Closed-Loop DC Servo Motor Position Control System    |
| <b>Week 12</b>          | Lab 12: Derivative Controller/ D Controller Used in Closed-Loop DC Servo Motor Speed Control System     |
| <b>Week 13</b>          | Lab 13: Derivative Controller/ D Controller Used in Closed-Loop DC Servo Motor Position Control System  |
| <b>Week 14 &amp; 15</b> | Lab 14: PID Controller                                                                                  |

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                   | Available in the Library? |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Modern Control Engineering, K. Ogata, 2010 Pearson Education                                                                                                           | Yes                       |
| <b>Recommended Texts</b> | 1 . Control Systems Engineering, U.A. Bakshi and S.C. Goyal, 2007 Technical Publications.<br>2 . Modern Control Systems, R. Dorf and R. Bishop, 2011 Pearson Education | No                        |

### Grading Scheme

#### مخطط الدرجات

| Group                           | Grade                   | التقدير             | Marks (%) | Definition                            |
|---------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group (50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                 | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                 | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                 | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                 | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group (0 – 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                 | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                 |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information          |                                           |                               |                                                                                                                                                                                                                                          |
|-----------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية     |                                           |                               |                                                                                                                                                                                                                                          |
| Module Title                | Digital Signal Processing                 |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                 | Core                                      |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                 | CET3103                                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                | 5                                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                | 125                                       |                               |                                                                                                                                                                                                                                          |
| Module Level                | 3                                         | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department    | CET                                       | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader               | Hussain Safa                              |                               | e-mail                                                                                                                                                                                                                                   |
| Module Leader's Acad. Title | Asst. Lec.                                | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                |                                           |                               | e-mail                                                                                                                                                                                                                                   |
| Peer Reviewer Name          | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |

|                                           |            |                       |     |
|-------------------------------------------|------------|-----------------------|-----|
| <b>Scientific Committee Approval Date</b> | 29/10/2023 | <b>Version Number</b> | 1.0 |
|-------------------------------------------|------------|-----------------------|-----|

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                               | 77. Demonstrate an understanding of basic discrete-time systems, linearity, time-invariance, stability, impulse response and discrete convolution.<br>78. Implement discrete time systems, recursive and nonrecursive realizations.<br>79. Perform Z transform and finding the inverse Z transform including its properties.<br>80. Demonstrate an understanding of frequency analysis of both continuous and discrete signals.<br>81. Demonstrate an understanding of frequency response of linear time invariant systems.<br>82. Demonstrate an understanding of discrete Fourier transform, its properties and applications.<br>83. Design FIR and IIR digital filters. |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | 1. State, prove and apply Shannon's sampling theorem<br>2. Relate signal to noise ratio (SNR) to number of samples averaged in signal sampling and averaging systems<br>3. Implement sampling of continuous time signals and reconstruct them from their samples by choosing appropriate parameters and functions.<br>4. Change the sampling rate of discrete-time signals, avoiding folding effects.<br>5. Describe the fundamental properties of linear time invariant systems.<br>6. Analyze signals and systems in the discrete time domain.<br>7. Compute the frequency response of linear and time-invariant discrete-time                                           |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p>systems, implement decomposition into a minimum-phase system and an all-pass system, and describe generalized linear-phase systems.</p> <ol style="list-style-type: none"> <li>8. Implement discrete-time systems using various structures.</li> <li>9. Understand the importance of the discrete Fourier transform and algorithms for its fast computation.</li> <li>10. Analyze discrete-time signals in the frequency domain, using the windowing method as well as the time-dependent discrete Fourier transform, and reconstruct the signal with the overlap-sum algorithm.</li> <li>11. Write down, state the properties of, and apply Fourier Transforms in DSP systems</li> <li>12. Analyze and implement systems in the field of Z transformation.</li> <li>13. Design basic finite impulse response (FIR) and infinite impulse response (IIR) filters.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                               |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><u>Introduction to DSP</u><br/>Introduction to DSP, discrete signals and their properties. In addition, the concept of frequency in continuous time and discrete time signals. [5 hrs]</p> <p><u>Discrete systems</u><br/>Discrete systems, linear time-invariant systems, convolution theorem;<br/>Digital Signal Processing (DSP) is concerned with the processing of signals that are represented as sequences of finite-precision numbers. [10 hrs]</p> <p><u>Sampling and reconstruction of analogue signals</u><br/>Review of continuous-time signal and system analysis using Fourier ; Ideal impulse sampling and reconstruction of bandlimited signals; digital to analogue conversion, and practical considerations. [10 hrs]</p> <p><u>Discrete-time sequences</u><br/>Discrete-time signals and systems, linearity, time-invariance, stability, causality; discrete-time convolution, linear constant-coefficient difference equations, magnitude and phase response. [5 hrs]</p> <p><u>The Discrete Fourier Transform</u><br/>The discrete Fourier transform (DFT); properties of the DFT; circular convolution; linear convolution via the DFT and the overlap-add method; the radix-2 decimation-in-</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>time fast Fourier transform (FFT) algorithm. [10 hrs]</p> <p><u>The z-transform and its properties</u></p> <p>The z-transform, region of convergence for the z-transform, inverse z-transform, z-transform properties. [10 hrs]</p> <p><u>FIR filter design</u></p> <p>Generalized linear-phase causal FIR filters; FIR linear-phase filter design using the window method; frequency-sampling design of FIR filters. [10 hrs]</p> <p><u>IIR filter design</u></p> <p>IIR filter design using the bilinear transformation; Filter design by impulse invariance response. [10 hrs]</p> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.</p> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |



| Module Evaluation               |                                                                                                                                                                                                                                      |             |                  |            |                           |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية           |                                                                                                                                                                                                                                      |             |                  |            |                           |
|                                 |                                                                                                                                                                                                                                      | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment            | Quizzes                                                                                                                                                                                                                              | 2           | 10% (10)         | 5, 10      | LO #1-4 , LO #4-9         |
|                                 | Assignments                                                                                                                                                                                                                          | 2           | 10% (10)         | 3, 12      | LO # 1,2, LO #3-11        |
|                                 | Projects / Lab.                                                                                                                                                                                                                      | 1           | 10% (10)         | Continuous |                           |
|                                 | Report                                                                                                                                                                                                                               | 1           | 10% (10)         | 13         | LO # 1-11                 |
| Summative assessment            | Midterm Exam                                                                                                                                                                                                                         | 2 hr        | 10% (10)         | 6          | LO # 1-5                  |
|                                 | Final Exam                                                                                                                                                                                                                           | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment                |                                                                                                                                                                                                                                      |             | 100% (100 Marks) |            |                           |
| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                                                                                      |             |                  |            |                           |
| المنهاج الاسبوعي النظري         |                                                                                                                                                                                                                                      |             |                  |            |                           |
|                                 | Material Covered                                                                                                                                                                                                                     |             |                  |            |                           |
| Week 1                          | <b>Signals, Systems and signal processing</b><br>Basic element of digital signal processing, Advantages of digital over analog signal processing, Classification of Signals                                                          |             |                  |            |                           |
| Week 2                          | <b>The Concept of frequency in Continuous and Discrete – time signals</b><br>Continuous – time sinusoidal signals, Discrete – time sinusoidal signals, Harmonically related complex exponential.                                     |             |                  |            |                           |
| Week 3                          | <b>Analog –to-digital and digital-to-analog conversions</b><br>Sampling of analog signals, The sampling theorem, Quantization and conversion, Digital-to-analog conversion, Analog-to-digital conversion.                            |             |                  |            |                           |
| Week 4                          | Analysis of digital signals and systems.                                                                                                                                                                                             |             |                  |            |                           |
| Week 5                          | <b>Convolution in discrete time systems</b>                                                                                                                                                                                          |             |                  |            |                           |
| Week 6                          | Mid-term Exam                                                                                                                                                                                                                        |             |                  |            |                           |
| Week 7                          | <b>DE convolution in discrete time systems</b>                                                                                                                                                                                       |             |                  |            |                           |
| Week 8                          | <b>Discrete-time systems</b><br>Input/output description of systems, Block diagram representation of discrete-time systems, Classification of discrete-time system, Correlation of discrete-time signals, Properties of correlation. |             |                  |            |                           |
| Week 9                          | <b>Time domain to frequency domain conversion</b><br>Discrete-Fourier transform                                                                                                                                                      |             |                  |            |                           |
| Week 10                         | Fast-Fourier transform                                                                                                                                                                                                               |             |                  |            |                           |
| Week 11                         | The Z-transform<br>Direct Z-transform                                                                                                                                                                                                |             |                  |            |                           |

|                |                                                     |
|----------------|-----------------------------------------------------|
| <b>Week 12</b> | Inverse Z-transform, Properties of the Z-transform. |
| <b>Week 13</b> | Analogue Filtering versus Digital filtering         |
| <b>Week 14</b> | <b>Design methods of FIR Filters</b>                |
| <b>Week 15</b> | <b>Design Methods of IIR Filters</b>                |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                             |
|---------------|----------------------------------------------|
| <b>Week 1</b> | Lab 1: Discrete and Continuous-Time Signals. |
| <b>Week 2</b> | Lab 2: Discrete-Time Systems.                |
| <b>Week 3</b> | Lab 3: Frequency Analysis.                   |
| <b>Week 4</b> | Lab 4: Sampling and Reconstruction.          |
| <b>Week 5</b> | Lab 5: Discrete Fourier Transform.           |
| <b>Week 6</b> | Lab 6: The Z-transform.                      |
| <b>Week 7</b> | Lab 7: Digital Filter Design.                |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                          | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Digital Signal Processing by John Proakis & D. G. Manolakis, 4/E. Pearson, 2006.                                                                              | Yes                       |
| <b>Recommended Texts</b> | Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.                                                            | No                        |
| <b>Websites</b>          | <a href="https://www.youtube.com/watch?v=6dFnpz_AEyA&amp;list=PL9567DFCA3A66F299">https://www.youtube.com/watch?v=6dFnpz_AEyA&amp;list=PL9567DFCA3A66F299</a> |                           |

### Grading Scheme

مخطط الدرجات

| Group                | Grade                | التقدير | Marks (%) | Definition              |
|----------------------|----------------------|---------|-----------|-------------------------|
| <b>Success Group</b> | <b>A - Excellent</b> | امتياز  | 90 - 100  | Outstanding Performance |

|                        |                  |                     |         |                                       |
|------------------------|------------------|---------------------|---------|---------------------------------------|
| (50 - 100)             | B - Very Good    | جيد جدا             | 80 - 89 | Above average with some errors        |
|                        | C - Good         | جيد                 | 70 - 79 | Sound work with notable errors        |
|                        | D - Satisfactory | متوسط               | 60 - 69 | Fair but with major shortcomings      |
|                        | E - Sufficient   | مقبول               | 50 - 59 | Work meets minimum criteria           |
| Fail Group<br>(0 – 49) | FX – Fail        | راسب (قيد المعالجة) | (45-49) | More work required but credit awarded |
|                        | F – Fail         | راسب                | (0-44)  | Considerable amount of work required  |
|                        |                  |                     |         |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                            |                      |                                                                                                                                                                                                                                          |                              |  |  |
|------------------------------------|----------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--|--|
| معلومات المادة الدراسية            |                            |                      |                                                                                                                                                                                                                                          |                              |  |  |
| Module Title                       | Digital Controllers        |                      | Module Delivery                                                                                                                                                                                                                          |                              |  |  |
| Module Type                        | Core                       |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                              |  |  |
| Module Code                        | CET3104                    |                      |                                                                                                                                                                                                                                          |                              |  |  |
| ECTS Credits                       | 5                          |                      |                                                                                                                                                                                                                                          |                              |  |  |
| SWL (hr/sem)                       | 125                        |                      |                                                                                                                                                                                                                                          |                              |  |  |
| Module Level                       | 3                          | Semester of Delivery | 5                                                                                                                                                                                                                                        |                              |  |  |
| Administering Department           | CET                        | College              | EETC                                                                                                                                                                                                                                     |                              |  |  |
| Module Leader                      | Dawood Sallem Hussian      |                      | e-mail                                                                                                                                                                                                                                   | dawood.hussian@altuff.edu.ig |  |  |
| Module Leader's Acad. Title        | Assist Lecturer            |                      | Module Leader's Qualification                                                                                                                                                                                                            | MSc                          |  |  |
| Module Tutor                       |                            |                      |                                                                                                                                                                                                                                          |                              |  |  |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud |                      | e-mail                                                                                                                                                                                                                                   | mahmoud.shukur@mtu.edu.iq    |  |  |
| Scientific Committee Approval Date | 29/10/2023                 |                      | Version Number                                                                                                                                                                                                                           | 1.0                          |  |  |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 1. To know the types of microcontrollers and its architecture<br>2. To understand the difference between the microcontroller and microprocessor<br>3. dealing with the internal parts of microcontrollers<br>4. programming the PIC microcontrollers<br>5. connect the microcontrollers with peripherals to input and output the information<br>6. Implement interrupts in programs<br>7. Programming the PIC with the peripherals devices                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 14. Recognize how integrated circuits and microcontrollers works.<br>15. Known the advantages of using Microcontrollers and Microprocessors.<br>16. Summarize what is meant by a Peripheral Interface Controller.<br>17. Describe the PIC Microcontroller.<br>18. Known type and function of register and SFR in Microcontroller.<br>19. Explain the A/D (Analog-to-Digital) Converter.<br>20. Discuss Capture, Compare, and Pulse width modulation modules in PIC microcontrollers.<br>21. Define and implement interrupts in programs.<br>22. Explain serial communication systems.<br>23. Identify how the Oscillator works in an electric circuit.<br>24. Programming the microcontroller, outputting data/signals, reading data/signals, and character LCD.<br>25. Application projects of microcontrollers. |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | Indicative content includes the following.<br>--Introduction to Introduction to Microcontrollers, Integrated Circuits, General Organization of PIC Microcontrollers: Pins Properties, Registers & Special Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>registers, Ports (Input / Output), and Power Supply. Microcontroller Pins Features. The memory unit (ROM, Masked ROM, OTP ROM, UV EPROM, and EEPROM Memory). RAM memory and Flash memory. [15 hrs]</p> <p>--Central Processor Unit (CPU). Interrupt (example of interrupt in a microcontroller). Arithmetical Logical Unit (ALU). Instruction Decoder. Accumulator. Bus (Address Bus and Data Bus). [10 hrs]</p> <p>--Serial Communication, Baud rate, I2C Protocol, SPI (Serial Peripheral Interface), and UART (Universal Asynchronous Receiver/Transmitter) [15 hrs]</p> <p>--Oscillator. Timers, using interrupt in timer operating, Watchdog Timer. Counters [10 hrs]</p> <p>--Revision problem classes [5 hrs]</p> <p>--A/D (Analog-to-Digital) Converter, procedure takes place in the A/D converter module, overall plan of ADC, ADRESH, and ADRESL Registers, A/D Acquisition Requirements , ADCON0 Register &amp; ADCON1 Register, Reference Volts. CCP Modules (Capture, Compare, and Pulse width modulation in PIC microcontrollers [19 hrs]</p> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in learning and developing their skills in microcontrollers and logic thinking, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering the type of lab experiments involving assignments and project design activities that are interesting to the students.</p> |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع |    |                             |      |
|---------------------------------------------------------------------------|----|-----------------------------|------|
| <b>Structured SWL (h/sem)</b>                                             | 64 | <b>Structured SWL (h/w)</b> | 4.26 |

|                                                                                |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| الحمل الدراسي المنتظم للطلاب خلال الفصل                                        |     | الحمل الدراسي المنتظم للطلاب أسبوعيا                                      |      |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 125 |                                                                           |      |

| Module Evaluation<br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|--------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                            |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                       | Quizzes         | 2           | 10% (10)         | 5, 12      | LO #1-4, LO #5-10         |
|                                            | Assignments     | 2           | 10% (10)         | 4, 10      | LO #1-3, LO #4-9          |
|                                            | Projects / Lab. | 1           | 10% (10)         | Continuous |                           |
|                                            | Report          | 1           | 10% (10)         | 13         | LO # 1-10                 |
| Summative assessment                       | Midterm Exam    | 2 hr        | 10% (10)         | 9          | LO # 1-8                  |
|                                            | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment                           |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus)<br>المنهاج الاسبوعي النظري |                                                                                    |
|------------------------------------------------------------|------------------------------------------------------------------------------------|
|                                                            | Material Covered                                                                   |
| Week 1                                                     | Introduction to the microcontroller, the difference between MP and Microcontroller |
| Week 2                                                     | The architecture of PIC Microcontroller                                            |
| Week 3                                                     | General Organization of PIC, Registers & Special Function registers                |
| Week 4                                                     | Memory Units and CPU                                                               |
| Week 5                                                     | I/O ports of the Microcontroller                                                   |
| Week 6                                                     | Serial communication, Oscillator, and Timer/Counters                               |
| Week 7                                                     | Baud rate                                                                          |
| Week 8                                                     | Programming the Microcontroller                                                    |
| Week 9                                                     | Midterm Exam                                                                       |
| Week 10                                                    | outputting data/signals, Reading data/signals , Character LCD                      |
| Week 11                                                    | A/D converter & Analog Module                                                      |

|                |                                         |
|----------------|-----------------------------------------|
| <b>Week 12</b> | On-Chip CCP (Capture, Compare & PWM)    |
| <b>Week 13</b> | Microcontroller Interrupts Programming  |
| <b>Week 14</b> | EEPROM Programming                      |
| <b>Week 15</b> | Application projects of Microcontroller |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                                     |
|---------------|----------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to Micro C with a simple program                 |
| <b>Week 2</b> | Lab 2: Counter and Flash LED                                         |
| <b>Week 3</b> | Lab 3: program using Micro C to count from increasing and decreasing |
| <b>Week 4</b> | Lab 4: Seven Segment                                                 |
| <b>Week 5</b> | Lab 5: LCD & Switch                                                  |
| <b>Week 6</b> | Lab 6: program using Micro C to input analog signal and read data    |
| <b>Week 7</b> | Lab 7: EEPROM to read and write data.                                |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                      | Available in the Library? |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | PIC Microcontrollers: An Introduction to Microelectronics, Martin P. Bates.<br>Teach Yourself PIC Microcontrollers, M. Amer Iqbal Qureshi | Yes                       |
| <b>Recommended Texts</b> | Interfacing PIC Microcontrollers to Peripheral Devices:2011,                                                                              | No                        |
| <b>Websites</b>          |                                                                                                                                           |                           |

### Grading Scheme

مخطط الدرجات

| Group                               | Grade                | التقدير | Marks (%) | Definition                     |
|-------------------------------------|----------------------|---------|-----------|--------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent | امتياز  | 90 - 100  | Outstanding Performance        |
|                                     | <b>B</b> - Very Good | جيد جدا | 80 - 89   | Above average with some errors |
|                                     | <b>C</b> - Good      | جيد     | 70 - 79   | Sound work with notable errors |

|                        |                  |                     |         |                                       |
|------------------------|------------------|---------------------|---------|---------------------------------------|
|                        | D - Satisfactory | متوسط               | 60 - 69 | Fair but with major shortcomings      |
|                        | E - Sufficient   | مقبول               | 50 - 59 | Work meets minimum criteria           |
| Fail Group<br>(0 – 49) | FX – Fail        | راسب (قيد المعالجة) | (45-49) | More work required but credit awarded |
|                        | F – Fail         | راسب                | (0-44)  | Considerable amount of work required  |
|                        |                  |                     |         |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Digital Communications  |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                    |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3105                 |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                       |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                     |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                       | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mohammad Safa Jawad     | e-mail                        | mohamm.ad@outlook.com                                                                                                                                                                                                                    |
| Module Leader's Acad. Title        | Assist. Lecturer        | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                                    |
| Module Tutor                       |                         |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein | e-mail                        | osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |



| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |   |
|-------------------------------------------------------------------------|------|-----------------|---|
| <b>Prerequisite module</b>                                              |      | <b>Semester</b> | 5 |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |   |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                               | <p>The aims to students in third stage to defined and understand the</p> <ul style="list-style-type: none"> <li>-Concepts and terminology used in digital communications</li> <li>-The advantage and disadvantage of each type of digital communication systems</li> <li>-Types of Digital modulation</li> <li>- Send multiple digital signals at the same time and how to retrieve it</li> </ul>                                                                                                                                                                                                                                                                              |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | <ol style="list-style-type: none"> <li>1- Describe of concepts and terminology used in digital communications</li> <li>2 -Explain the advantage and disadvantage of each type of digital communications systems</li> <li>3- Identify types of digital modulation</li> <li>4- Discuss the comparison between the types of digital systems and its advantages</li> <li>5- work on digital systems and Describe the most suitable designs</li> <li>6- Explain how can send more than a signal at the same time and how to retrieve it</li> <li>7- analog signal into a digital signal converter ( PCM)</li> <li>8- Explain types of digital modulation ask , psk , fsk</li> </ol> |

|                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                        | 9- Explain the modulation and demodulation of quadrature amplitude modulation                                                                                                                                                                                                                                                                                                                       |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                      | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>- Introduction to digital communication &amp; Sampling theorem ( 10 hr )</li> <li>- Pulse Amplitude Modulation (PAM), Pulse width and Pulse Position ( 10 hr)</li> <li>- Source Coding Techniques Modulation ( 24 hr)</li> <li>- Baseband modulation (Digital Modulation), (30 hr)</li> </ul>              |
| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Strategies</b>                                                      | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                |            |                           |
|---------------------------------------------------|------------------------|-------------|----------------|------------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks) | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2           | 10% (10)       | 4,9        | LO #1-4, LO #4- 7         |
|                                                   | <b>Assignments</b>     | 2           | 10% (10)       | 3,10       | LO #1-4, LO #4- 7         |
|                                                   | <b>Projects / Lab.</b> | 10          | 10% (10)       | Continuous | LO #1-8                   |

|                             |                     |      |                  |            |          |
|-----------------------------|---------------------|------|------------------|------------|----------|
|                             | <b>Report</b>       | 10   | 10% (10)         | Continuous | LO #1-8  |
| <b>Summative assessment</b> | <b>Midterm Exam</b> | 2 hr | 10% (20)         | 6          | LO # 1-5 |
|                             | <b>Final Exam</b>   | 4hr  | 50% (50)         | 16         | All      |
| <b>Total assessment</b>     |                     |      | 100% (100 Marks) |            |          |

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|                 | <b>Material Covered</b>                                                                      |
|-----------------|----------------------------------------------------------------------------------------------|
| <b>Week 1</b>   | Signal types, General block diagram of digital communication                                 |
| <b>Week 2</b>   | Advantage and disadvantage of digital modulation, digital coding                             |
| <b>Week 3</b>   | Sampling theorem, Pulse Amplitude Modulation (PAM),                                          |
| <b>Week 4,5</b> | Pulse width and Pulse Position Modulation (PWM & PPM),                                       |
| <b>Week 6</b>   | Time Division Multiplexing (TDM) , Pulse Code Modulation PCM),                               |
| <b>Week 7</b>   | Mid exam                                                                                     |
| <b>Week 8</b>   | Noise Consideration in PCM, Limitation and Modifications of PCM                              |
| <b>Week 9</b>   | Differential PCM (DPCM), Delta Modulation (DM),                                              |
| <b>Week 10</b>  | Delta-Sigma Modulation                                                                       |
| <b>Week 11</b>  | Baseband modulation (Digital Modulation)                                                     |
| <b>Week 12</b>  | Amplitude Shift Keying (ASK) [Modulation and demodulation].                                  |
| <b>Week 13</b>  | Frequency Shift Keying (FSK) [Modulation and demodulation],                                  |
| <b>Week 14</b>  | Phase Shift Keying (PSK) [Modulation, Coherent and Noncoherent Detection], Differential PSK. |
| <b>Week 15</b>  | Quadrature Phase Shift Keying (QPSK)                                                         |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | <b>Material Covered</b>                                            |
|---------------|--------------------------------------------------------------------|
| <b>Week 1</b> | Fourier series and Fourier Transform , Spectrum analysis of signal |

|               |                                          |
|---------------|------------------------------------------|
| <b>Week 2</b> | Pulse Amplitude Modulation               |
| <b>Week 3</b> | Pulse Position Modulation (PPM)          |
| <b>Week 4</b> | Pulse Code Modulation                    |
| <b>Week 5</b> | Digital Time Division Multiplexing (TDM) |
| <b>Week 6</b> | Delta Modulation (DM)                    |
| <b>Week 7</b> | Amplitude shift key (ASK)                |
| <b>Week 8</b> | Phase Shift Key (PSK)                    |
| <b>Week 9</b> | Frequency Shift Key (FSK)                |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                  | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | - Sarkar N., Elements of Digital Communications, first edition, 2003                  | NO                        |
| <b>Recommended Texts</b> | - Haykin S., Introduction to Analog and Digital Communications, second edition, 2007. | No                        |
| <b>Websites</b>          | <a href="https://www.coursera.org">https://www.coursera.org</a>                       |                           |

### Grading Scheme

مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                            |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                            |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Real-Time Systems          |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | E                          |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3106                    |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                          | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                        | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Salman Rasheed Owaid       | e-mail                        | raheedsalman161@gmail.com                                                                                                                                                                                                                |
| Module Leader's Acad. Title        | Lecturer                   | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |
| Module Tutor                       |                            | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                 | Version Number                | 1.0                                                                                                                                                                                                                                      |

### Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

### Module Aims, Learning Outcomes and Indicative Contents

#### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ol style="list-style-type: none"> <li>1. To teach the students about Real-time scheduling and schedulable analysis.</li> <li>2. To enable the students to Formally specify and verify the timing constraints</li> <li>3. Design methods for real-time systems</li> <li>4. Development and implementation of new techniques to advance the state-of-the-art real-time systems research.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ul style="list-style-type: none"> <li>• correctly and precisely reason about times, events, and action</li> <li>• list and reason about the sources of error and inexactitude in time interval measurement, execution time prediction, and scheduling</li> <li>• empirically estimate the accuracy of a real time clock</li> <li>• measure the execution time of a piece of code</li> <li>• empirically estimate the accuracy and overhead of a real-time scheduler</li> <li>• describe and apply commonly used abstract models and terminology for real-time scheduling and resource management</li> <li>• recognize, classify, and formulate the hard and soft timing requirements of a software system</li> <li>• select an appropriate software architecture and combination of scheduling techniques to satisfy a set of timing requirements</li> <li>• understand and apply the proofs of the fundamental theorems of deadline and fixed priority real-time scheduling</li> <li>• carry out schedulability analysis using deadline and fixed-priority approaches</li> <li>• implement a set of tasks with periodic and aperiodic timing requirements, using C threads and a real-time variant of the Linux operating system</li> <li>• evaluate the suitability of an operating system for real-time applications</li> </ul> |
|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p>Part-A [20 Hrs]</p> <p>Introduction to RTS: what is system, what is RT, what is the concept of time in systems, classification, specs of each type, how and when,</p> <p>Part-B [20Hrs]</p> <p>Scheduling: the concept of scheduling, types, clock, priority, aperiodic, sporadic tasks, resource access, resource control</p> <p>Part-C [20 Hrs]</p> <p>Multi-processor scheduling: coordination, resource sharing, temporal constraints.</p> <p>Part-D [10 hrs]</p> <p>RTOS, Datastores, timers, kernels</p> |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <p><b>Learning and Teaching Strategies</b><br/>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                       | <p>The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.</p> |

| <p><b>Student Workload (SWL)</b><br/>الحمل الدراسي للطالب موزع على (15) اسبوع</p> |           |                                                                              |             |
|-----------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------|-------------|
| <p><b>Structured SWL (h/sem)</b><br/>الحمل الدراسي المنتظم للطالب خلال الفصل</p>  | <p>64</p> | <p><b>Structured SWL (h/w)</b><br/>الحمل الدراسي المنتظم للطالب أسبوعياً</p> | <p>4.26</p> |

|                                                                                |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 4.26 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 125 |                                                                           |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                  |            |                           |
|---------------------------------------------------|------------------------|-------------|------------------|------------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2           | 10% (10)         | 6, 10      | LO #1-5, LO #5-9          |
|                                                   | <b>Assignments</b>     | 2           | 10% (10)         | 8, 13      | LO #1-6, LO #6- 10        |
|                                                   | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous |                           |
|                                                   | <b>Report</b>          | 1           | 10% (10)         | 14         | LO # 1- 12                |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 7          | LO # 1-6                  |
|                                                   | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>                           |                        |             | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                          |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                  |
| <b>Week 1</b>                                                     | Introduction to RTs                                                                                      |
| <b>Week 2</b>                                                     | Hard Versus Soft Real-Time Systems                                                                       |
| <b>Week 3</b>                                                     | A Reference Model of Real-Time Systems                                                                   |
| <b>Week 4</b>                                                     | Commonly Used Approaches to Hard Real-Time Scheduling                                                    |
| <b>Week 5</b>                                                     | Clock-Driven Scheduling                                                                                  |
| <b>Week 6</b>                                                     | Priority-Driven Scheduling of Periodic Tasks                                                             |
| <b>Week 7</b>                                                     | <b>Midterm Exam</b>                                                                                      |
| <b>Week 8</b>                                                     | Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems. Resources and Resource Access Control |
| <b>Week 9</b>                                                     | Clock sync, timers, Kernels                                                                              |
| <b>Week 10</b>                                                    | RT in distributed Systems                                                                                |



|                |                                |
|----------------|--------------------------------|
| <b>Week 11</b> | Scheduling in multi-processors |
| <b>Week 12</b> | Clock Sync.                    |
| <b>Week 13</b> | Hardware, timers, Kernels      |
| <b>Week 14</b> | RTOS                           |
| <b>Week 15</b> | Real Time data stores          |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                      |
|-------------------------------------------------------------------------|----------------------|
|                                                                         | Material Covered     |
| <b>Week 1</b>                                                           | Arduino UC           |
| <b>Week 2</b>                                                           | Static loops         |
| <b>Week 3</b>                                                           | Dynamic loops        |
| <b>Week 4</b>                                                           | Watchdog             |
| <b>Week 5</b>                                                           | Timers               |
| <b>Week 6</b>                                                           | Arduino RTOS         |
| <b>Week 7</b>                                                           |                      |
| <b>Week 8</b>                                                           |                      |
| <b>Week 9</b>                                                           |                      |
| <b>Week 10</b>                                                          |                      |
| <b>Week 11</b>                                                          | Network app (client) |
| <b>Week 12</b>                                                          | Network app (server) |
| <b>Week 13</b>                                                          | Network app (UDP)    |
| <b>Week 14 &amp; 15</b>                                                 | Proto-typing         |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                               |                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                                                                                                                                                          | Available in the Library? |
| <b>Required Texts</b>                                           | Real-Time Systems, Jane W. S. Liu, 2000                                                                                                                                                       | NO                        |
| <b>Supporting Texts</b>                                         |                                                                                                                                                                                               | No                        |
| <b>Online resource</b>                                          | <a href="https://www.youtube.com/watch?v=yShUSwskUNA&amp;list=PL1iLu2CSC9EU4mMByEhBp9CcYgAliDs_v">https://www.youtube.com/watch?v=yShUSwskUNA&amp;list=PL1iLu2CSC9EU4mMByEhBp9CcYgAliDs_v</a> |                           |

|  |                                                                                                                                                                                                                                                                                                            |  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <a href="https://personal.utdallas.edu/~cxl137330/courses/fall13/RTS/RTS.html">https://personal.utdallas.edu/~cxl137330/courses/fall13/RTS/RTS.html</a><br><br><a href="http://www.cs.fsu.edu/~baker/realtime/syllabus.html#Objectives">http://www.cs.fsu.edu/~baker/realtime/syllabus.html#Objectives</a> |  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Parallel Computing      |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Elective                |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3107                 |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                       |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                     |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                       | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        |                         | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                       |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein | e-mail                        | osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |

### Relation with other Modules

| العلاقة مع المواد الدراسية الأخرى |      |          |  |
|-----------------------------------|------|----------|--|
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ol style="list-style-type: none"> <li>1. To understand the basic principles of parallel computing.</li> <li>2. To demonstrate different types of parallel algorithms</li> <li>3. To deal with the basic concept of parallel programming.</li> <li>4. To evaluate the performance of the parallel programs.</li> <li>5. To apply parallel programming for solving different problems.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. Understand the fundamental concepts of parallel computing and its importance in modern computing systems.</li> <li>2. Demonstrate knowledge of different parallel computing architectures and their characteristics.</li> <li>3. Develop an understanding of parallel algorithms for specific computational tasks, such as sorting or graph algorithms.</li> <li>4. Demonstrate proficiency in using parallel computing libraries and tools, such as OpenMP or MPI.</li> <li>5. Analyze and evaluate the performance of parallel algorithms and programs.</li> <li>6. Design and implement parallel algorithms using parallel programming models and frameworks.</li> <li>7. Identify and overcome common challenges in parallel computing, such as load balancing and synchronization.</li> <li>8. Utilize parallel computing techniques to solve computationally intensive problems efficiently.</li> <li>9. Apply parallelization strategies to different types of applications, such as numerical simulations or data processing tasks.</li> <li>10. Optimize parallel programs through techniques like data partitioning and task scheduling.</li> <li>11. Understand the impact of parallel computing on energy consumption and efficiency.</li> <li>12. Explore advanced topics in parallel computing, such as parallel I/O or GPU programming.</li> </ol> |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Introduction to Parallel Computing [4]<br/>Motivation and importance of parallel computing, Taxonomy of parallel computing systems, Parallelism levels: task, data, and instruction-level parallelism</li> <li>2. Parallel Architectures [6]<br/><br/>Flynn's taxonomy: SISD, SIMD, MISD, MIMD; Shared-memory architectures: multiprocessors and multicores; Distributed-memory architectures: clusters and supercomputers; GPU architectures and programming models</li> <li>3. Parallel Programming Models [12]<br/><br/>Shared-memory programming: OpenMP, Pthreads; Message Passing Interface (MPI); GPU programming: CUDA, OpenCL; Programming shared-address space systems (OpenMP, Pthreads); Programming scalable systems (message passing: MPI, global address space languages)</li> <li>4. Parallel Algorithms and Techniques [10]<br/><br/>Parallelization techniques: task parallelism, data parallelism; decomposition techniques, mapping &amp; scheduling computation, templates</li> <li>5. Performance Analysis and Optimization [8]<br/><br/>Metrics for performance evaluation: speedup, efficiency, scalability; Bottleneck identification and optimization strategies; Load balancing techniques; Memory hierarchy optimization: caching and data locality</li> <li>6. Parallelization of Applications [12]<br/><br/>Non-numerical algorithms (sorting, graphs); Numerical algorithms (dense matrix algorithms, sparse matrix algorithms)</li> <li>8. Emerging Trends and Technologies [12]<br/><br/>Cluster, Grid, and Cloud computing and parallelism; Parallel computing in edge and IoT devices; Quantum computing and its potential impact on parallelism</li> </ol> |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                          | <p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through</p> |

|  |                                                                                                                                                         |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students. |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------|

| Student Workload (SWL)                                                         |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا                                        |     |                                                                           |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                           |      |

| Module Evaluation     |                 |             |                  |            |                           |
|-----------------------|-----------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |                 |             |                  |            |                           |
|                       |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 2           | 10% (10)         | 5, 13      | LO #1-4 and 5-10          |
|                       | Assignments     | 2           | 10% (10)         | 6, 12      | LO # 3-5 and 6-10         |
|                       | Projects / Lab. | 2           | 20% (20)         | Continuous | All                       |
| Summative assessment  | Midterm Exam    | 2 hr        | 10% (10)         | 7          | LO # 1-7                  |
|                       | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment      |                 |             | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                          |
|-------------------------------------------------------------------|--------------------------------------------------------------------------|
|                                                                   | Material Covered                                                         |
| Week 1                                                            | introduction of parallel computing                                       |
| Week 2                                                            | Parallel Architectures                                                   |
| Week 3                                                            | Parallel Algorithms and Techniques                                       |
| Week 4                                                            | Programming shared-address space systems                                 |
| Week 5                                                            | Programming scalable systems                                             |
| Week 6                                                            | Performance Analysis and Optimization                                    |
| Week 7                                                            | Mid Term Exam                                                            |
| Week 8                                                            | Analytical modeling of program performance                               |
| Week 9                                                            | Collective communication                                                 |
| Week 10                                                           | Synchronization                                                          |
| Week 11                                                           | Non-numerical algorithms (sorting, graphs)                               |
| Week 12                                                           | Numerical algorithms (dense matrix algorithms, sparse matrix algorithms) |
| Week 13                                                           | Performance measurement and analysis of parallel programs                |
| Week 14                                                           | GPU Programming                                                          |
| Week 15                                                           | Emerging Trends and Technologies                                         |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                  |
|-------------------------------------------------------------------------|------------------|
|                                                                         | Material Covered |

|               |                                                                                  |
|---------------|----------------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to Parallel Programming                                      |
| <b>Week 2</b> | Lab 2: Implement Parallel Reduction using Min, Max, Sum, and Average operations. |
| <b>Week 3</b> | Lab 3: parallel algorithms for Vector Operations.                                |
| <b>Week 4</b> | Lab 4: parallel algorithms for Matrix Operations.                                |
| <b>Week 5</b> | Lab 5: Parallel Sorting Algorithms.                                              |
| <b>Week 6</b> | Lab 6: Parallel Search Algorithm.                                                |
| <b>Week 7</b> | Lab 7: Parallel Search Algorithm.                                                |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                  |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                 | <b>Text</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                           | <ul style="list-style-type: none"> <li>An Introduction to Parallel Computing, Design and Analysis of Algorithms, 2/e. Ananth Grama, Vipin Kumar, Anshul Gupta, and George Karypis. Addison-Wesley, 2003.</li> <li>Parallel Programming in C with MPI and OpenMP. Michael J. Quinn. McGraw Hill, 2004</li> </ul>                                                                                                                                 | Yes                              |
| <b>Recommended Texts</b>                                        | <ul style="list-style-type: none"> <li>Using OpenMP: Portable Shared Memory Parallel Programming - Barbara Chapman, Gabriele Jost, Ruud van der Pas (2008)</li> <li>Using MPI: Portable Parallel Programming with the Message-Passing Interface, 3rd Ed - William Gropp, Ewing Lusk, Anthony Skjellum (2014)</li> <li>Programming Massively Parallel Processors: A Hands-on Approach, 3rd Ed. - David B. Kirk, Wen-mei W. Hwu (2016)</li> </ul> | No                               |
| <b>Websites</b>                                                 | <a href="https://www.mcs.anl.gov/~itf/dbpp/">https://www.mcs.anl.gov/~itf/dbpp/</a>                                                                                                                                                                                                                                                                                                                                                             |                                  |



| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b><br><b>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                            | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br><b>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                 | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                           |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                           |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Advanced Control Systems                  |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                                      |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3201                                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                                       |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                                         | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                                       | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mohammed Albaker Najm Abed                | e-mail                        | eng.mohammed.iq99@gmail.com                                                                                                                                                                                                              |
| Module Leader's Acad. Title        | Asst. Lecturer                            | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                       |                                           |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                                      |

## Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                             |         |                 |  |
|-----------------------------|---------|-----------------|--|
| <b>Prerequisite module</b>  | CET3102 | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None    | <b>Semester</b> |  |

### Module Aims, Learning Outcomes and Indicative Contents

#### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 84. To define the stability analysis techniques applicable to control systems.<br>85. To develop problem-solving skills and an understanding of different stability criteria.<br>86. To understand the principles and conditions under which a system is stable or unstable.<br>87. To introduce students to stability margins, such as gain margin and phase margin.<br>88. To emphasize the importance of stability in feedback control systems.<br>89. To highlight the relationship between stability and system performance.                                                                                                                                                                                                                                                                                                                                                |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 1. Define poles and zeros of a transfer function.<br>2. Analyze the stability of the control system from the pole-zero plot.<br>3. Analyze the stability of the control system using Routh-Hurwitz criteria.<br>4. Identify the special cases of Routh's criterion.<br>5. Sketch the locus of roots in the s-plane as a parameter is varied.<br>6. Obtain $G(s)H(s)$ from characteristic equation<br>7. Comment on the stability of the system based on the complete Root Locus.<br>8. Solve Root Locus problems.<br>9. Define the frequency response of a system.<br>10. Use the logarithmic scales.<br>11. Identify the standard factors of $G(j\omega)H(j\omega)$ .<br>12. Plot a graph of the system's frequency response using a Bode plot.<br>13. Comment on the stability of the system based on the Bode plot.<br>14. Obtaining the Transfer function from the Bode plot |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | Indicative content includes the following.<br><br><u>Part A – Stability of Control System</u><br>Poles and zeros of a transfer function, pole-zero plot, stability condition about s-plane, Hurwitz's criterion, Routh's stability criterion, special cases of Routh's                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>criterion: special case 1 and special case 2. [ 10 hrs]</p> <p>Revision problem classes [ 6 hrs]</p> <p><u>Part B – Root Locus Method</u></p> <p>Definition of Root Locus, Rules of construction of Root Locus, General steps to solve the problem in Root Locus, obtaining <math>G(s)H(s)</math> from the characteristic equation. [14 hrs].</p> <p>Revision problem classes [ 8 hrs]</p> <p><u>Part C – Bode Plot Method</u></p> <p>Basics of frequency domain analysis, Magnitude plot, Phase angle plot, Logarithmic scales, frequency domain O.L.T.F., standard factors of <math>G(j\omega)H(j\omega)</math>, steps to sketch the Bode plot, stability analysis using Bode plot. [16 hrs]</p> <p>Revision problem classes [ 8 hrs]</p> <p>Transfer function from Bode plot [8 hrs]</p> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.</p> |

| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطالب موزع على (15) اسبوع</b> |    |                                                                            |      |
|----------------------------------------------------------------------------------|----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل         | 64 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b>                                                  | 61 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |

|                                                                   |     |  |
|-------------------------------------------------------------------|-----|--|
| الحمل الدراسي غير المنتظم للطلاب خلال الفصل                       |     |  |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل | 125 |  |

| Module Evaluation<br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|--------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                            |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                       | Quizzes         | 2           | 10% (10)         | 3, 12      | LO # 1, 2, LO# 3- 11      |
|                                            | Assignments     | 2           | 10% (10)         | 6, 11      | LO # 1-5, LO# 6-10        |
|                                            | Projects / Lab. | 1           | 10% (10)         | Continuous |                           |
|                                            | Report          | 1           | 10% (10)         | 13         | LO # 9-13                 |
| Summative assessment                       | Midterm Exam    | 2 hr        | 10% (10)         | 8          | LO # 1-7                  |
|                                            | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment                           |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus)<br>المنهاج الاسبوعي النظري |                                                         |
|------------------------------------------------------------|---------------------------------------------------------|
|                                                            | Material Covered                                        |
| Week 1                                                     | Introduction to Stability of Control Systems            |
| Week 2                                                     | Routh-Hurwitz Criterion                                 |
| Week 3                                                     | Special Cases of Routh's Criterion                      |
| Week 4                                                     | Root Locus Method                                       |
| Week 5                                                     | Rules of Root Locus                                     |
| Week 6                                                     | Solve Root Locus Problems                               |
| Week 7                                                     | Stability Analysis Using Root Locus                     |
| Week 8                                                     | Mid-term Exam                                           |
| Week 9                                                     | Stability Analysis Using Bode plot                      |
| Week 10                                                    | Basics of Frequency Domain Analysis                     |
| Week 11                                                    | Bode Plot Method                                        |
| Week 12                                                    | Bode Plot of Standard Factors of $G(j\omega)H(j\omega)$ |
| Week 13                                                    | Stability Analysis Using Bode plot                      |

|                |                                                      |
|----------------|------------------------------------------------------|
| <b>Week 14</b> | Transfer Function from Bode Plot                     |
| <b>Week 15</b> | Design of control systems and Compensation concepts. |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                               |
|-------------------------------------------------------------------------|-----------------------------------------------|
|                                                                         | <b>Material Covered</b>                       |
| <b>Week 1</b>                                                           | Lab 1: introduction to MATLAB commands        |
| <b>Week 2 , 3 &amp; 4</b>                                               | Lab 2: Responses to different input signals   |
| <b>Week 5 , 6 &amp; 7</b>                                               | Lab 3: Pole- Zero Plot and stability analysis |
| <b>Week 8 , 9, 10 &amp; 11</b>                                          | Lab 4: Root locus in MATLAB                   |
| <b>Week 12 ,13 , 14 &amp; 15</b>                                        | Lab 5: Bode plot in MATLAB                    |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                        |                                  |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                 | <b>Text</b>                                                                                                                                                            | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                           | Modern Control Engineering, K. Ogata, 2010 Pearson Education                                                                                                           | Yes                              |
| <b>Recommended Texts</b>                                        | 3 . Control Systems Engineering, U.A. Bakshi and S.C. Goyal, 2007 Technical Publications.<br>4 . Modern Control Systems, R. Dorf and R. Bishop, 2011 Pearson Education | No                               |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                               |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                               |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Computer Network Fundamentals |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                          |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3202                       |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                             |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                           |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                             | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                           | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mohammed Albaker Najm Abed    | e-mail                        | eng.mohammed.iq99@gmail.com                                                                                                                                                                                                              |
| Module Leader's Acad. Title        | Assistant Lecturer            | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                       |                               | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud    | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                    | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |
|-----------------------------------|------|
| العلاقة مع المواد الدراسية الأخرى |      |
| Prerequisite module               | None |
| Semester                          |      |



|                      |      |          |  |
|----------------------|------|----------|--|
| Co-requisites module | None | Semester |  |
|----------------------|------|----------|--|

### Module Aims, Learning Outcomes and Indicative Contents

#### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <p>90. Understand the Basics of Networking: The module aims to provide students with a solid foundation in the fundamental concepts, principles, and components of computer networking.</p> <p>91. Understand the purpose and importance of computer networks, network architectures, and network protocols.</p> <p>92. Explore Network Infrastructure: The module aims to familiarize students with different types of networks, such as Local Area Networks (LANs) and Wide Area Networks (WANs).</p> <p>93. Explore various network devices and technologies used in building and managing networks.</p> <p>94. Network Addressing and Subnetting Skills: The module aims to enable students to comprehend IP addressing, subnetting, and related concepts.</p> <p>95. Network Standards and Protocols: The module aims to introduce students to network standards and protocols established by organizations such as IEEE, IETF, and ISO</p>                                                                                 |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>26. Explain the data communications, networking, protocols and standards, and networking models and how to create a data flow.</p> <p>27. Understand the Data communications between remote parties can be achieved through a process called networking.</p> <p>28. Understand the fundamental concepts and principles of computer networks, including network architectures, protocols, and models (such as OSI and TCP/IP).</p> <p>29. Identify and describe the different network components and their functions, including routers, switches, firewalls, access points, and network cables.</p> <p>30. Explain the relationship between data, which are created by a device, and electromagnetic signals, which are transmitted over a medium.</p> <p>31. Explain the basics of network addressing, including IP addressing, subnetting, and the use of subnet masks.</p> <p>32. Demonstrate knowledge of commonly used network protocols, such as IP, TCP, UDP, ICMP, and DNS, and understand their roles in network</p> |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p>communication.</p> <p>33. Analyze and describe different network topologies and architectures, including star, bus, ring, and mesh networks.</p> <p>34. Understand the fundamentals of network security, including common threats, encryption techniques, firewalls, and best practices for securing networks.</p> <p>35. Configure and troubleshoot basic network settings, including IP addressing, subnetting, and network connectivity.</p> <p>36. Explain the importance of network standards and protocols in ensuring interoperability and compatibility in network environments.</p> <p>37. Demonstrate an understanding of network performance factors and techniques for optimizing network performance, including bandwidth management and Quality of Service (QoS) implementation.</p> <p>38. Apply critical thinking and problem-solving skills to analyze and troubleshoot common network issues, such as network connectivity problems and network performance degradation.</p> <p>39. Work effectively as a team member in network-related activities, demonstrating communication and collaboration skills. Demonstrate practical skills in configuring and managing network devices, such as routers, switches, and wireless access points.</p> |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p>introduction to Computer Networks: <b>6 hrs</b></p> <p>Definition and purpose of computer networks : <b>6 hrs</b></p> <p>Network types and topologies : <b>6 hrs</b></p> <p>Network components and their functions : <b>6 hrs</b></p> <p>Network models: OSI and TCP/IP : <b>12 hrs</b></p> <p>Network Devices and Infrastructure : <b>6 hrs</b></p> <p>Routers, switches, and hubs : <b>6 hrs</b></p> <p>Network interfaces and media : <b>6 hrs</b></p> <p>Network cables and connectors : <b>6 hrs</b></p> <p>Network architectures: LAN, WAN, MAN : <b>6 hrs</b></p> <p>Network Addressing and Subnetting : <b>6 hrs</b></p> <p>IPv4 and IPv6 addressing : <b>6 hrs</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|  |                                                                                                              |
|--|--------------------------------------------------------------------------------------------------------------|
|  | Subnet masks and subnetting techniques : <b>6 hrs</b><br>IP address allocation and management : <b>4 hrs</b> |
|--|--------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4    |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                  |            |                           |
|---------------------------------------------------|------------------------|-------------|------------------|------------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2           | 10% (5)          | 3, 11      | LO #1, 2, LO# 3-10        |
|                                                   | <b>Assignments</b>     | 2           | 10% (5)          | 4, 12      | LO# 1-3, LO# 3-11         |
|                                                   | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous |                           |
|                                                   | <b>Report</b>          | 1           | 10% (10)         | 15         | LO # 1-13                 |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 7          | LO # 1-6                  |
|                                                   | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>                           |                        |             | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                             |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                     |
| <b>Week 1</b>                                                     | Introduction to Networking, definition and purpose of computer networks                                                     |
| <b>Week 2</b>                                                     | Basic Concepts of Networking, Line configuration                                                                            |
| <b>Week 3</b>                                                     | Transmission MOD                                                                                                            |
| <b>Week 4</b>                                                     | Categories of Networks                                                                                                      |
| <b>Week 5</b>                                                     | The OSI Model ,data protocol unit                                                                                           |
| <b>Week 6</b>                                                     | Main functions of the OSI Layers, TCP/IP Protocol Suite , IP address concept.                                               |
| <b>Week 7</b>                                                     | <b>Midterm Exam</b>                                                                                                         |
| <b>Week 8</b>                                                     | classes                                                                                                                     |
| <b>Week 9</b>                                                     | Subnetting                                                                                                                  |
| <b>Week 10</b>                                                    | Networking and Internetworks Devices                                                                                        |
| <b>Week 11</b>                                                    | Guided Transmission Media                                                                                                   |
| <b>Week 12</b>                                                    | Unguided Transmission media                                                                                                 |
| <b>Week 13</b>                                                    | Multiplexing technique                                                                                                      |
| <b>Week 14</b>                                                    | FDM,TDM, and CDM                                                                                                            |
| <b>Week 15</b>                                                    | Relationship between data, which are created by a device, and electromagnetic signals, which are transmitted over a medium. |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |
|-------------------------------------------------------------------------|
|-------------------------------------------------------------------------|

|               | Material Covered                                                                                                      |
|---------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to Network ,Familiarization with the lab environment and tools                                    |
| <b>Week 2</b> | Lab 2: Introduction to Networking Equipment familiarization with network devices such as routers, switches, and hubs. |
| <b>Week 3</b> | Lab 3: Connecting and configuring network devices.                                                                    |
| <b>Week 4</b> | Lab 4: Network Cabling and Connections                                                                                |
| <b>Week 5</b> | Lab 5: Configuring and troubleshooting Ethernet connections                                                           |
| <b>Week 6</b> | Lab 6: IP Addressing and Subnetting , assigning IP addresses to network devices.                                      |
| <b>Week 7</b> | Lab 7: Network Configuration and Troubleshooting                                                                      |

| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                             |                           |
|----------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------|
|                                                          | Text                                                                        | Available in the Library? |
| <b>Required Texts</b>                                    | " TCP/IP Protocol Suite" Fourth Edition Behrouz A. Forouzan                 | NO                        |
| <b>Recommended Texts</b>                                 | "Data Communications and Networking", Fourth Edition by Behrouz A. Forouzan | No                        |
| <b>Websites</b>                                          |                                                                             |                           |

| Grading Scheme<br>مخطط الدرجات      |                         |                     |           |                                       |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                            |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                            |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Database Systems           |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                       |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3203                    |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                          | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                        | College                       | EETC                                                                                                                                                                                                                                     |
| n                                  | Ali Hussein Jawad Almimar  | e-mail                        | alialmimar@altuff.edu.iq                                                                                                                                                                                                                 |
| Module Leader's Acad. Title        | Asst. Lec.                 | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                       |                            |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                 | Version Number                | 1.0                                                                                                                                                                                                                                      |

## Relation with other Modules

| العلاقة مع المواد الدراسية الأخرى |      |          |  |
|-----------------------------------|------|----------|--|
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ol style="list-style-type: none"> <li>1. To learn the theory of the database.</li> <li>2. To understand The Entity Relationship Model.</li> <li>3. To Introduce SQL and SQL and relational database concepts.</li> <li>4. To understand the Constraints imposed in a database.</li> <li>5. Learn about Boolean Operators in SQL.</li> <li>6. Learn about Normalization of a database.</li> </ol> Learn about Storage and Query Processing, transaction, and recovery.                                                                                                                                                                                                                                                                                                                                              |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. To learn the theory of the database.</li> <li>2. To understand The Entity Relationship Model.</li> <li>3. To Introduce SQL and SQL and relational database concepts.</li> <li>4. To understand the Constraints imposed in a database.</li> <li>5. Learn about Boolean Operators in SQL.</li> <li>6. Learn about Normalization of a database.</li> </ol> Learn about Storage and Query Processing, transaction, and recovery.                                                                                                                                                                                                                                                                                                                                              |
|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p>Part-A [15 Hrs]</p> <p>Introduction to the theory: What is the benefit of using a database versus a shared file system? What is Data models and the relational database system? Data independence versus data-dependent data and how a database addresses these two issues. The Three-level Architecture and why it is necessary. What are the characteristics of each of these levels and the role of the database administrator in establishing the separation of these levels? What is database management systems, its components and how they work together?</p> <p>Part-B [20Hrs]</p> <p>The Entity Relationship Model: ER diagrams, resolution of M:N relationships, and Table Instance Charts (TICs). Translations of TICs into relational tables.</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Introduction to SQL and relational database concepts: Relations and attributes. Candidate and primary keys. Foreign keys and why they are necessary. Introduction to relational operators and how they are applied. Creating and deleting tables.</p> <p>Constraints imposed in a database: Updating and deleting rows in a table using the UPDATE TABLE, DELETE TABLE, and the DROP TABLE command with and without constraints. Implementation of the Selection and Projection operators. Ordering the results of a table according to a given attribute in ascending or descending orders.</p> <p>Part-C [20 Hrs]</p> <p>Boolean Operators in SQL: pattern matching using the LIKE clause, % and underscore characters. Arithmetic Operations and use of built-in functions in SQL. Introduction to Group functions using the Group by clause and additional built in functions. Processing dates and time and basic arithmetic with dates. Formatting of dates and times.</p> <p>Normalization of a database.: First, second and third normal forms. How to detect anomalies and use of the Armstrong's axioms for determining functional dependencies. Importance of normalizing a database and the types of anomalies that may be encountered in First, Second, and Third Normal Forms. How to recognize, prevent, and how to get rid of anomalies in these forms.</p> <p>Part-D [20 hrs]</p> <p>Continuation of the normalization process: BCNF form and Dependency preservation. Algorithms to ensure dependency preservation. The Join operator and its different types. Advantages and disadvantages of higher normal forms from an operational point of view.</p> <p>Storage and Query Processing: RAID, Storage access, indexing and hashing, query processing and query optimization.</p> <p>Part-E [3] [10]</p> <p>Transaction Management and concurrency control: Transactions (concepts, state) and concurrency control (methods).</p> <p>Database Recovery: Concept and Recovery Techniques</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                       |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | The main strategy that will be adopted in delivering this module focuses on fostering |



|                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                           |      |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------|
|                                                                                | active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process. |                                                                           |      |
| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                           |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4    |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                           |      |

|                                                   |                        |                    |                       |                 |                                  |
|---------------------------------------------------|------------------------|--------------------|-----------------------|-----------------|----------------------------------|
| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |                    |                       |                 |                                  |
|                                                   |                        | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2                  | 10% (5)               | 6, 10           | LO #1-3 , LO #4-6                |
|                                                   | <b>Assignments</b>     | 2                  | 10% (10)              | 8, 13           | LO # 1,2, LO# 3-5                |
|                                                   | <b>Projects / Lab.</b> | 1                  | 10% (10)              | Continuous      |                                  |
|                                                   | <b>Report</b>          | 1                  | 10% (10)              | 14              | LO#1- 7                          |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr               | 10% (10)              | 6               | LO # 1-5                         |
|                                                   | <b>Final Exam</b>      | 4hr                | 50% (50)              | 16              | All                              |
| <b>Total assessment</b>                           |                        |                    | 100% (100 Marks)      |                 |                                  |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Week 1</b>                                                     | <b>Introduction to the theory:</b> What is the benefit of using a database versus a shared file system? What is Data models and the relational database system? Data independence versus data-dependent data and how a database addresses these two issues. The Three-level Architecture and why it is necessary. What are the characteristics of each of these levels and the role of the database administrator in establishing the separation of these levels? What is database management systems, its components and how they work together? |
| <b>Week 2</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Week 3</b>                                                     | <b>The Entity Relationship Model:</b> ER diagrams, resolution of M:N relationships, and Table Instance Charts (TICs). Translations of TICs into relational tables.                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Week 4</b>                                                     | <b>Introduction to SQL and relational database concepts:</b> Relations and attributes. Candidate and primary keys. Foreign keys and why they are necessary. Introduction to relational operators and how they are applied. Creating and deleting tables.                                                                                                                                                                                                                                                                                          |
| <b>Week 5</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Week 6</b>                                                     | <b>Midterm Exam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Week 7</b>                                                     | <b>Constraints imposed in a database:</b> Updating and deleting rows in a table using the UPDATE TABLE, DELETE TABLE, and the DROP TABLE command with and without constraints. Implementation of the Selection and Projection operators. Ordering the results of a table according to a given attribute in ascending or descending orders.                                                                                                                                                                                                        |
| <b>Week 8</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Week 9</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Week 10</b>                                                    | <b>Boolean Operators in SQL:</b> pattern matching using the LIKE clause, % and underscore characters. Arithmetic Operations and use of built-in functions in SQL. Introduction to Group functions using the Group by clause and additional built in functions. Processing dates and time and basic arithmetic with dates. Formatting of dates and times.                                                                                                                                                                                          |
| <b>Week 11</b>                                                    | <b>Normalization of a database.:</b> First, second and third normal forms. How to detect anomalies and use of the Armstrong's axioms for determining functional dependencies. Importance of normalizing a database and the types of anomalies that may be encountered in First, Second, and Third Normal Forms. How to recognize, prevent, and how to get rid of anomalies in these forms.                                                                                                                                                        |
| <b>Week 12</b>                                                    | <b>Continuation of the normalization process:</b> BCNF form and Dependency preservation. Algorithms to ensure dependency preservation. The Join operator and its different types. Advantages and disadvantages of higher normal forms from an operational point of view, join algorithm types.                                                                                                                                                                                                                                                    |
| <b>Week 13</b>                                                    | <b>Storage and Query Processing:</b> RAID, Storage access, indexing and hashing, query processing and query optimization.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Week 14</b>                                                    | <b>Transaction Management and concurrency control:</b> Transactions (concepts, state) and concurrency control (methods).                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                |                                                                             |
|----------------|-----------------------------------------------------------------------------|
| <b>Week 14</b> | <b>Database Recovery:</b> Concept and Recovery Techniques                   |
| <b>Week 15</b> | <b>Non-Relational Database systems:</b> Document, Key-value, Column, Graph. |

| Delivery Plan (Weekly Lab. Syllabus) |                                                                                                                                                                                                                                      |                           |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| المنهاج الاسبوعي للمختبر             |                                                                                                                                                                                                                                      |                           |
|                                      | Material Covered                                                                                                                                                                                                                     |                           |
| Week 1                               | An Overview of Database and SQL Query language: Introduction to PHP and MySQL, Setup steps, HTML Review Form Handling                                                                                                                |                           |
| Week 2                               | Basic PHP syntax, Comments, outputs                                                                                                                                                                                                  |                           |
| Week 3                               | Arithmetic and variable operation                                                                                                                                                                                                    |                           |
| Week 4                               | PHP: control statements, Loops, and Arrays                                                                                                                                                                                           |                           |
| Week 5                               | Creating Database, tables in SQL                                                                                                                                                                                                     |                           |
| Week 6                               | Attribute Data Types and Domains in SQL                                                                                                                                                                                              |                           |
| Week 7                               | The Entity Relationship (ER) Model: Drawing and converting entities with a relationship to relation table                                                                                                                            |                           |
| Week 8                               | SQL Server Constraints, Select, Inserting to Data from Database                                                                                                                                                                      |                           |
| Week 9                               | Updating, Deleting, ordered By Data from Database                                                                                                                                                                                    |                           |
| Week 10                              | Group Functions: AVG, MIN, MAX, SUM                                                                                                                                                                                                  |                           |
| Week 11                              | Join in SQL Server                                                                                                                                                                                                                   |                           |
| Week 12                              | View data from Database                                                                                                                                                                                                              |                           |
| Week 13                              | Nested sub-queries                                                                                                                                                                                                                   |                           |
| Week 14 & 15                         | Complete web application using PHP and MySQL                                                                                                                                                                                         |                           |
| Learning and Teaching Resources      |                                                                                                                                                                                                                                      |                           |
| مصادر التعلم والتدريس                |                                                                                                                                                                                                                                      |                           |
|                                      | Text                                                                                                                                                                                                                                 | Available in the Library? |
| Required Texts                       | Book#1: C. J. Date, “Introduction to Database Systems”, 8th Ed. Publisher: Addison-Wesley, 2003<br><br>Book#2: Ramez Elmasri, Shamkant B. Navathe, " Fundamentals of Database Systems",7 <sup>th</sup> Ed. Publisher: Pearson, 2016. | NO                        |

|                         |                                                                                                                                                                                                                                         |    |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Supporting Texts</b> | Reference#1: A. Silberschatz, H. F.Korth, and S. Sudarshan, "Database System Concepts", 5th Ed. McGraw-Hill (2006).<br><br>5. Reference#2: Database Systems the Complete Book by H. Garcia-Molina and et al. Prentice Hall; 2nd Edition | No |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                     |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                     |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Engineering Analysis                |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                                |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3204                             |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                   |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                                 |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                                   | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                                 | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Hussein Safa                        |                               | e-mail                                                                                                                                                                                                                                   |
| Module Leader's Acad. Title        | Asst. Lec.                          | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                       |                                     | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah Taher Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval Date | 29/10/2023                          | Version Number                | 1.0                                                                                                                                                                                                                                      |

### Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                      |                          |          |   |
|----------------------|--------------------------|----------|---|
| Prerequisite module  | Mathematics II (CET1204) | Semester | 2 |
| Co-requisites module |                          | Semester |   |

### Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <p>This course aims to provide students with a fundamental understanding of basic and advanced engineering analysis techniques, including engineering components and systems.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>40. Introduce the students to the theory and application of Laplace transform.</p> <p>41. Give students an understanding of the time and frequency domain with different functions.</p> <p>42. Get better in powered circuit analysis with applications and practical examples of matrix in Matlab.</p> <p>43. Introduce the z-transform, which is the generalisation of the Laplace transform to discrete-time systems.</p> <p>44. Provide students with a fundamental understanding of basic and advanced statistical techniques.</p> <p>45. Provide students with a fundamental understanding of statistical measurements and graphs.</p> <p>46. Provide an introduction to the method, tools and ideas of numerical computation, including the bisection method, false position method, and Newton-Raphson method.</p> <p>47. Use numerical methods for solving algebraic and transcendental equations and solutions of linear and non-linear simultaneous equations.</p> <p>48. Understand the basic theory of the numerical solution of ordinary differential equations.</p> <p>49. Be familiar with the theorem that is related to matrices and its applications to analysis of the electronic circuits.</p> <p>50. Learning the method of solving complicated equations.</p> <p>51. Applying all of the above outcomes practically using Matlab.</p> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>- Laplace Transform [15 hrs]</li> <li>- Z-transform [15 hrs]</li> <li>- Numerical computations [15hrs]</li> <li>- solution of linear simultaneous [10hrs]</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|  |                                                                                                                                                                                                                    |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>- Solution of nonlinear equation [5 hrs]</li> <li>- Numerical solution of ordinary differential equation [5 hrs]</li> <li>- High-level assessment Matrix [5 hrs]</li> </ul> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering the type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4    |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 5, 10      | LO #1-3 , LO # 4-10       |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 2, 12      | LO # 1,2 , LO # 3-10      |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous |                           |
|                             | <b>Report</b>          | 1           | 10% (10)         | 13         | LO # 1-11                 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 5          | LO # 1-5                  |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                      |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
|                                                                   | Material Covered                                                                                     |
| <b>Week 1</b>                                                     | Fundamental of Laplace transform (L.T)                                                               |
| <b>Week 2</b>                                                     | properties, theorem of L.T                                                                           |
| <b>Week 3</b>                                                     | Applications of L.T in electronic circuits                                                           |
| <b>Week 4</b>                                                     | Fundamental of Z-transform (Z.T), properties of Z.T                                                  |
| <b>Week 5</b>                                                     | <b>Midterm Exam</b>                                                                                  |
| <b>Week 6</b>                                                     | theorem of Z.T                                                                                       |
| <b>Week 7</b>                                                     | Applications of Z.T                                                                                  |
| <b>Week 8</b>                                                     | Numerical computations                                                                               |
| <b>Week 9</b>                                                     | (bisection method, false position method,                                                            |
| <b>Week 10</b>                                                    | Newton Raphson's method, solution of algebraic and transcendental equations                          |
| <b>Week 11</b>                                                    | solution of linear simultaneous equations :<br>1)Direct methods: a)Gauss elimination B)Gauss Jordan  |
| <b>Week 12</b>                                                    | 2)Iterative method a)Jacobi's B)Gauss seidel iteration)                                              |
| <b>Week 13</b>                                                    | Solution of nonlinear equation (Newton Raphson method)                                               |
| <b>Week 14</b>                                                    | Numerical solution of ordinary differential equation (Picard's, Euler's method)                      |
| <b>Week 15</b>                                                    | Matrices solution of the linear system of equations, linear transformations, Cayley-Hamilton theorem |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                 |
|-------------------------------------------------------------------------|-----------------------------------------------------------------|
|                                                                         | Material Covered                                                |
| <b>Week 1</b>                                                           | Lab 1: Using Matlab in engineering analysis                     |
| <b>Week 2</b>                                                           | Lab 2: application of Laplace transform in electronic circuits. |
| <b>Week 3</b>                                                           | Lab 3: application of Z-transform                               |
| <b>Week 4</b>                                                           | Lab 4: bisection method                                         |



|                                                                             |                                                                                                                   |                           |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------|
| Week 5                                                                      | Lab 5: newton-Raphson method                                                                                      |                           |
| Week 6                                                                      | Lab 6: Numerical solution of ordinary D.E                                                                         |                           |
| Week 7                                                                      | Lab 7: Gaussian elimination and Gaussian Jordan methods                                                           |                           |
| <div>Learning and Teaching Resources</div> <div>مصادر التعلم والتدريس</div> |                                                                                                                   |                           |
|                                                                             | Text                                                                                                              | Available in the Library? |
| Required Texts                                                              | Higher Engineering Mathematics by Dr. B.S. Grewal                                                                 | Yes                       |
| Recommended Texts                                                           | An introduction to Numerical analysis by David F. Mayers                                                          | yes                       |
| Websites                                                                    | <a href="http://www.ocw.mit.edu">www.ocw.mit.edu</a> , <a href="http://www.math.uiowa.edu">www.math.uiowa.edu</a> |                           |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|------------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                               |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance                  |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors           |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors           |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings         |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria              |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work is required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | A considerable amount of work required   |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                          |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                          |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Data Communications     |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                    |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3205                 |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                       |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                     |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                       | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mohammad Safa Jawad     | e-mail                        | mohamm.ad@outlook.com                                                                                                                                                                                                                    |
| Module Leader's Acad. Title        | Assist. Lecturer        | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                                    |
| Module Tutor                       |                         |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein | e-mail                        | osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |   |
|-----------------------------------|------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |      |          |   |
| Prerequisite module               |      | Semester | 5 |
| Co-requisites module              | None | Semester |   |

| Module Aims, Learning Outcomes and Indicative Contents           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | The aims to students in third stage to defined and understand the<br>Digital Modulation<br>Synchronization<br>Line Codes<br>Spread Spectrum Systems<br>Satellite Communication                                                                                                                                                                                                                                                                                                             |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 1- Describe digital communications modulation and Explain the modulation and demodulation of quadrature amplitude modulation<br>2 -Explain the advantage and disadvantage of each type of digital communications systems<br>4- Discuss the comparison between the types of digital systems and its advantages<br>5- Explain Synchronization<br>6- Describe Spread Spectrum Systems<br>7- Explain types Satellite Communication<br>8-Describe the Advantages and Applications of Microwaves |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | Indicative content includes the following. <ul style="list-style-type: none"> <li>- Digital Modulation ( 10 hr )</li> <li>- Synchronization ( 10 hr)</li> <li>- Line Codes ( 10 hr)</li> <li>- Spread Spectrum Systems (15 hr)</li> <li>- Satellite Communication (15hr)</li> <li>- Microwaves(10hr)</li> </ul>                                                                                                                                                                            |

|                                                                        |                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                  |            |                           |
|---------------------------------------------------|------------------------|-------------|------------------|------------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2           | 10% (10)         | 4,9        | LO #1-4, LO #4- 8         |
|                                                   | <b>Assignments</b>     | 2           | 10% (10)         | 3,10       | LO #1-4, LO #4- 8         |
|                                                   | <b>Projects / Lab.</b> | 10          | 10% (10)         | Continuous | LO #1-8                   |
|                                                   | <b>Report</b>          | 10          | 10% (10)         | Continuous | LO #1-8                   |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr        | 10% (20)         | 6          | LO # 1-8                  |
|                                                   | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>                           |                        |             | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                    |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | Material Covered                                                                                                                   |
| <b>Week 1</b>                                                     | Digital Modulation: Quadrature Phase Shift Keying (QPSK), Offset QPSK                                                              |
| <b>Week 2</b>                                                     | Minimum Shift Keying, Gaussian Minimum Shift Keying (GMSK).                                                                        |
| <b>Week 3</b>                                                     | Quadrature Amplitude Modulation (QAM), Multilevel Modulation Techniques M-ary PSK, M-ary QAM                                       |
| <b>Week 4</b>                                                     | Synchronization: Phase Locked Loop (PLL) Recovery; Carrier Recovery: square law device,.                                           |
| <b>Week 5</b>                                                     | Costas loop, DF PLL; Clock Recovery: spectrum line method, minimum mean square error, early-late gate method                       |
| <b>Week 6</b>                                                     | Line Codes: Binary Line Codes; Multilevel Signaling                                                                                |
| <b>Week 7</b>                                                     | Mid exam                                                                                                                           |
| <b>Week 8</b>                                                     | Spread Spectrum Systems: Introduction; Advantages and Disadvantages; Pseudo Noise Sequence (PN Sequence) Generation and Properties |
| <b>Week 9,10</b>                                                  | Spread Spectrum Systems: Direct Sequence Spread Spectrum; Frequency Hopping Spread Spectrum (SFH, FFH).                            |
| <b>Week 11</b>                                                    | Satellite Communication: introduction; Types Of Satellites; Frequency Bands;                                                       |
| <b>Week 12</b>                                                    | Satellite Construction; Satellite Link Design;                                                                                     |
| <b>Week 13</b>                                                    | Modulation and Multiplexing Techniques: FDM/FM, TDM; Multiple Access: FDMA, TDMA, CDMA.                                            |
| <b>Week 14</b>                                                    | Typical Frequencies; Band Designation;                                                                                             |
| <b>Week 15</b>                                                    | Introduction to antennas & Microwaves , Advantages of Microwaves; Applications of Microwaves.                                      |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                                              |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|                                                                         | Material Covered                                                                             |
| <b>Week 1</b>                                                           | Quadrature Phase Shift Keying (QPSK)                                                         |
| <b>Week 2</b>                                                           | Minimum Shift Keying                                                                         |
| <b>Week 3</b>                                                           | Quadrature Amplitude Modulation (QAM), Multilevel Modulation Techniques M-ary PSK, M-ary QAM |
| <b>Week 4</b>                                                           | Phase Locked Loop (PLL) Recovery                                                             |
| <b>Week 5,6</b>                                                         | Direct Sequence Spread Spectrum; Frequency Hopping Spread Spectrum (SFH, FFH).               |

|                 |                                                                            |
|-----------------|----------------------------------------------------------------------------|
| <b>Week 7</b>   | Satellite Link Design; Modulation and Multiplexing Techniques: FDM/FM, TDM |
| <b>Week 8,9</b> | Design Multiple Access: FDMA, TDMA, CDMA                                   |

| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                    |                                  |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------|
|                                                                        | <b>Text</b>                                                                        | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                                  | - Sarkar N., Elements of Digital Communications, first edition, 2003               | NO                               |
| <b>Recommended Texts</b>                                               | - <b>Data Communications and Networking, Fourth Edition by Behrouz A. Forouzan</b> | No                               |
| <b>Websites</b>                                                        |                                                                                    |                                  |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b>                                                                                                                                                                                                                                                                                                                                         |                         |                     |                  |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| <b>Group</b>                                                                                                                                                                                                                                                                                                                                                                         | <b>Grade</b>            | <b>التقدير</b>      | <b>Marks (%)</b> | <b>Definition</b>                     |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100         | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89          | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79          | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69          | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59          | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)          | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)           | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |                  |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |                  |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                    |                                           |                               |                                                                                                                                                                                                                                          |                              |
|---------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| معلومات المادة الدراسية               |                                           |                               |                                                                                                                                                                                                                                          |                              |
| Module Title                          | Digital Image Processing                  |                               | Module Delivery                                                                                                                                                                                                                          |                              |
| Module Type                           | Elective                                  |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                              |
| Module Code                           | CET3206                                   |                               |                                                                                                                                                                                                                                          |                              |
| ECTS Credits                          | 5                                         |                               |                                                                                                                                                                                                                                          |                              |
| SWL (hr/sem)                          | 125                                       |                               |                                                                                                                                                                                                                                          |                              |
| Module Level                          | 3                                         | Semester of Delivery          |                                                                                                                                                                                                                                          | 6                            |
| Administering Department              | CET                                       | College                       | EETC                                                                                                                                                                                                                                     |                              |
| Module Leader                         | Dawood Sallem Hussian                     |                               | e-mail                                                                                                                                                                                                                                   | dawood.hussian@altuff.edu.ig |
| Module Leader's Acad. Title           | Asst. Lec.                                | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |                              |
| Module Tutor                          |                                           |                               |                                                                                                                                                                                                                                          |                              |
| Peer Reviewer Name                    | Asst. Prof. Alhamzah<br>Taher<br>Mohammed |                               | e-mail                                                                                                                                                                                                                                   | alhamza_tm@mtu.edu.iq        |
| Scientific Committee Approval<br>Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                                      |                              |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br><b>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><b>أهداف المادة الدراسية</b>                                                                               | 96. To become familiar with digital image fundamentals<br>97. To get exposed to simple image enhancement techniques in Spatial and Frequency domain.<br>98. To learn concepts of degradation function and restoration techniques.<br>99. To study the image segmentation and representation techniques.<br>100. To become familiar with image compression and recognition methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | 52. Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.<br>53. describe features of images.<br>54. Have a good understanding of the mathematical foundations for digital manipulation of images.<br>55. Operate on images using the techniques of smoothing, sharpening and enhancement.<br>56. image acquisition; preprocessing; segmentation; Fourier domain processing, compression and<br>57. analysis.<br>58. Be able to write programs using Matlab language for digital manipulation of images; image<br>59. Understand the restoration concepts and filtering techniques.<br>60. Be able to understand the documentation for, and make use of, the MATLAB library and MATLAB.<br>61. Acquisition; preprocessing; segmentation; Fourier domain processing; and compression.<br>62. Learn and understand the Image Enhancement in the Spatial Domain.<br>63. Learn and understand the Image Enhancement in the Frequency Domain.<br>64. Learn the basics of segmentation, features extraction, compression and recognition methods for color models. |
| <b>Indicative Contents</b><br><b>المحتويات الإرشادية</b>                                                                         | Indicative content includes the following.<br><br><u>Fundamentals</u><br>Need for DIP- Fundamental steps in DIP – Elements of visual perception -Image sensing and Acquisition – Image Sampling and Quantization – Imaging geometry, discrete image mathematical characterization. [15 hrs]<br><u>Image Transforms</u><br>Two dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT, Discrete cosine transform and KL transform.-Discrete Short time Fourier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Transform- and its application in Compression. [10 hrs]</p> <p><u>Image Enhancement</u></p> <p>Spatial Domain: Basic relationship between pixels- Basic Gray level Transformations – Histogram Processing – Smoothing spatial filters- Sharpening spatial filters. Frequency Domain: Smoothing frequency domain filters- sharpening frequency domain filters Homomorphic filtering. [15 hrs]</p> <p><u>Image Restoration:</u></p> <p>Overview of Degradation models –Unconstrained and constrained restorations- Inverse Filtering , Wiener-Filter. [10 hrs]</p> <p><u>Feature Extraction:</u></p> <p>Detection of discontinuities – Edge linking and Boundary detection- Thresholding- - Edge based segmentation-Region based Segmentation- matching-Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors. [10 hrs]</p> <p><u>Image Reconstruction from Projections:</u></p> <p>Need- Radon Transform – Back projection operator- Projection Theorem- Inverse Radon Transform. [10 hrs]</p> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>The assessment strategy for this module is designed to provide students with the opportunity to demonstrate the skills and knowledge as described in the learning outcomes. The written examination will assess the knowledge of terminology, concepts and theory of Digital Image Processing, as well as the ability to analyze problems and apply mathematical models of signal processing to solve and predict effects. The laboratory experiments will evaluate the acquired technical skills and expertise required to apply these methods to practical Digital Image Processing tasks.</p> |

| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطالب موزع على (15) اسبوع</b> |
|----------------------------------------------------------------------------------|
|----------------------------------------------------------------------------------|

|                                                                                |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 125 |                                                                           |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |                    |                       |                 |                                  |
|---------------------------------------------------|------------------------|--------------------|-----------------------|-----------------|----------------------------------|
|                                                   |                        | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2                  | 10% (10)              | 5, 10           | LO #1-4, LO#5-8                  |
|                                                   | <b>Assignments</b>     | 2                  | 10% (10)              | 3, 12           | LO # 1,2, LO# 3-11               |
|                                                   | <b>Projects / Lab.</b> | 1                  | 10% (10)              | Continuous      |                                  |
|                                                   | <b>Report</b>          | 1                  | 10% (10)              | Continuous      |                                  |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr               | 10% (10)              | 7               | LO # 1-6                         |
|                                                   | <b>Final Exam</b>      | 4hr                | 50% (50)              | 16              | All                              |
| <b>Total assessment</b>                           |                        |                    | 100% (100 Marks)      |                 |                                  |

**Delivery Plan (Weekly Syllabus)**

المنهاج الاسبوعي النظري

|         | Material Covered                                                                                                                                                                                                                                                                                                                             |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1  | <b>• Introduction and Digital Image Fundamentals:</b> <ul style="list-style-type: none"> <li>• The origins of Digital Image Processing</li> <li>• Examples of Fields that Use Digital Image Processing</li> <li>• Fundamentals Steps in Image Processing</li> </ul>                                                                          |
| Week 2  | <b>Introduction and Digital Image Fundamentals (cont.):</b> <ul style="list-style-type: none"> <li>• Image Sampling and Quantization,</li> <li>• Some basic relationships like Neighbors, Connectivity, Distance</li> <li>• Measures between pixels</li> <li>• Translation, Scaling, Rotation and Perspective Projection of image</li> </ul> |
| Week 3  | <b>Introduction and Digital Image Fundamentals (cont.):</b> <ul style="list-style-type: none"> <li>• Linear and Non Linear Operations</li> </ul>                                                                                                                                                                                             |
| Week 4  | <b>Image Enhancement in the Spatial Domain:</b> <ul style="list-style-type: none"> <li>• Some basic Gray Level Transformations</li> <li>• Histogram Processing</li> </ul>                                                                                                                                                                    |
| Week 5  | <b>Image Enhancement in the Spatial Domain (cont.):</b> <ul style="list-style-type: none"> <li>• Enhancement Using Arithmetic and Logic operations</li> </ul>                                                                                                                                                                                |
| Week 6  | <b>Image Enhancement in the Spatial Domain (cont.):</b> <ul style="list-style-type: none"> <li>• Combining Spatial Enhancement Methods</li> <li>• Basics of Spatial Filters</li> </ul>                                                                                                                                                       |
| Week 7  | Mid-term Exam                                                                                                                                                                                                                                                                                                                                |
| Week 8  | <b>Image Enhancement in the Spatial Domain (cont.):</b> <ul style="list-style-type: none"> <li>• Smoothing and Sharpening Spatial Filters</li> </ul>                                                                                                                                                                                         |
| Week 9  | <b>Image Enhancement in the Spatial Domain (cont.):</b> <ul style="list-style-type: none"> <li>• Histogram Processing</li> </ul>                                                                                                                                                                                                             |
| Week 10 | <b>Image Enhancement in the Frequency Domain:</b> <ul style="list-style-type: none"> <li>• Introduction to Fourier Transform and the frequency Domain</li> <li>• Computing and Visualizing</li> </ul>                                                                                                                                        |
| Week 11 | <b>Image Enhancement in the Frequency Domain (cont.):</b> <ul style="list-style-type: none"> <li>• Smoothing Frequency Domain Filters</li> </ul>                                                                                                                                                                                             |
| Week 12 | <b>Image Restoration:</b> <ul style="list-style-type: none"> <li>• A model of The Image Degradation / Restoration Process</li> </ul>                                                                                                                                                                                                         |
| Week 13 | <b>Image Restoration (cont.):</b> <ul style="list-style-type: none"> <li>• Inverse filtering</li> <li>• Wiener filtering</li> </ul>                                                                                                                                                                                                          |
| Week 14 | <b>Image Segmentation:</b> <ul style="list-style-type: none"> <li>• Detection of Discontinuities</li> </ul>                                                                                                                                                                                                                                  |

|                |                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <ul style="list-style-type: none"> <li>• Edge linking and boundary detection</li> <li>• Thresholding</li> </ul>                                   |
| <b>Week 15</b> | <b>Object Recognition:</b> <ul style="list-style-type: none"> <li>• Patterns and Pattern Classes</li> <li>• Decision-Theoretic Methods</li> </ul> |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                                                                                                                                            |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                         | Material Covered                                                                                                                                                                           |
| <b>Week 1</b>                                                           | Lab 1: Digital image Representation <ul style="list-style-type: none"> <li>• Reading, Displaying, Writing Images using MATLAB</li> <li>• Data Classes, Image Types using MATLAB</li> </ul> |
| <b>Week 2</b>                                                           | Lab 2: Digital image Representation (cont.) <ul style="list-style-type: none"> <li>• Introduction to M Function Programming using MATLAB</li> </ul>                                        |
| <b>Week 3</b>                                                           | Lab 3: Image Enhancement in the Spatial Domain: <ul style="list-style-type: none"> <li>• Intensity Transformation Function (MATLAB)</li> </ul>                                             |
| <b>Week 4</b>                                                           | Lab 4: Image Enhancement in the Spatial Domain (cont.): <ul style="list-style-type: none"> <li>• Histogram Processing and Function Plotting (MATLAB)</li> </ul>                            |
| <b>Week 5</b>                                                           | Lab 5: Image Restoration                                                                                                                                                                   |
| <b>Week 6</b>                                                           | Lab 6: Image Segmentation.                                                                                                                                                                 |
| <b>Week 7</b>                                                           | Lab 7: Object Recognition:                                                                                                                                                                 |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |
|-----------------------------------------------------------------|
|-----------------------------------------------------------------|

|                          | Text                                                                                                                                                          | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Fundamentals of Digital Image Processing, Anil.K.Jain – ,Pearson Education-2003.                                                                              | No                        |
| <b>Recommended Texts</b> | Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, Third Edition, 2010.                                                               | No                        |
| <b>Websites</b>          | <a href="https://www.youtube.com/watch?v=6dFnpz_AEyA&amp;list=PL9567DFCA3A66F299">https://www.youtube.com/watch?v=6dFnpz_AEyA&amp;list=PL9567DFCA3A66F299</a> |                           |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |
| Module Title                       | IoT Fundamentals        |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Elective                |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET3207                 |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                       |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                     |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                       | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        |                         | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                       |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein | e-mail                        | osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>6. To understand the basic principles of the Internet of Things.</li> <li>7. To study the relationship between IoT and M2M.</li> <li>8. To deal with using Arduino for IoT implementation.</li> <li>9. To deal with using Raspberry Pi for IoT implementation.</li> <li>10. To apply IoT solutions in different fields.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>13. Understand the basic concepts, architecture, and components of the Internet of Things (IoT).</li> <li>14. Identify and describe the various networking technologies and protocols used in IoT systems, such as Wi-Fi, Bluetooth, Zigbee, and MQTT.</li> <li>15. Explain the role of sensors, actuators, and embedded systems in IoT applications.</li> <li>16. Gain knowledge of different IoT platforms and frameworks for developing IoT solutions.</li> <li>17. Demonstrate proficiency in designing and implementing simple IoT applications using Arduino boards.</li> <li>18. Gain knowledge of using Python with the IoT platforms.</li> <li>19. Demonstrate proficiency in designing and implementing simple IoT applications using Raspberry Pi boards.</li> <li>20. Understand the principles of data communication and data management in IoT systems, including data collection, storage, and analysis.</li> <li>21. Evaluate the impact of IoT on various industries, such as healthcare, transportation, agriculture, and smart cities.</li> <li>22. Develop skills in integrating IoT devices and systems with cloud platforms and web services.</li> <li>23. Apply IoT technologies to solve real-world problems and develop innovative IoT applications.</li> <li>24. Collaborate effectively in teams to design and implement IoT projects or case studies.</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p>Part A - IoT concepts [14 hrs]</p> <p>Introduction to the Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Part B – IoT using Arduino [16 hrs]</p> <p>Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors, and Actuators with Arduino,</p> <p>Part C – IoT Using Raspberry Pi [16 hrs]</p> <p>Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi, Introduction to Software-defined Network (SDN), SDN for IoT, Data Handling, and Analytics.</p> <p>Part D – IoT Applications [20 hrs]</p> <p>Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring.</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.</p> |

| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</b> |
|---------------------------------------------------------------------------------|
|---------------------------------------------------------------------------------|



|                                                                                |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 125 |                                                                           |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |                    |                       |                 |                                  |
|---------------------------------------------------|------------------------|--------------------|-----------------------|-----------------|----------------------------------|
|                                                   |                        | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2                  | 10% (10)              | 5, 13           | LO #1-5 and 6-10                 |
|                                                   | <b>Assignments</b>     | 1                  | 10% (10)              | 10              | LO # 1-9                         |
|                                                   | <b>Projects / Lab.</b> | 2                  | 10% (5)               | Continuous      |                                  |
|                                                   | <b>Seminars</b>        | 1                  | 10% (10)              | Continuous      |                                  |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr               | 10% (10)              | 7               | LO # 1-7                         |
|                                                   | <b>Final Exam</b>      | 4hr                | 50% (50)              | 16              | All                              |
| <b>Total assessment</b>                           |                        |                    | 100% (100 Marks)      |                 |                                  |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                     |
|-------------------------------------------------------------------|-----------------------------------------------------|
|                                                                   | <b>Material Covered</b>                             |
| <b>Week 1</b>                                                     | introduction to the Internet of Things              |
| <b>Week 2</b>                                                     | IoT and M2M                                         |
| <b>Week 3</b>                                                     | Introduction to Arduino Programming and Interfacing |
| <b>Week 4</b>                                                     | Implementation of IoT with Arduino                  |
| <b>Week 5</b>                                                     | Introduction to Raspberry Pi and Interfacing        |

|                |                                                              |
|----------------|--------------------------------------------------------------|
| <b>Week 6</b>  | Implementation of IoT with Raspberry Pi                      |
| <b>Week 7</b>  | Mid Term Exam                                                |
| <b>Week 8</b>  | Data Handling and Analytics                                  |
| <b>Week 9</b>  | Sensor-Cloud                                                 |
| <b>Week 10</b> | Smart Cities and Smart Homes                                 |
| <b>Week 11</b> | Connected Vehicles                                           |
| <b>Week 12</b> | Smart Grid                                                   |
| <b>Week 13</b> | Industrial IoT                                               |
| <b>Week 14</b> | IoT Security                                                 |
| <b>Week 15</b> | IoT Case Study: Agriculture, Healthcare, Activity Monitoring |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                            |
|---------------|-------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Led Control Using Arduino Board                      |
| <b>Week 2</b> | Lab 2: Potentiometer And Ir Sensor Interfacing With Arduino |
| <b>Week 3</b> | Lab 3: Controlling Two Actuators Using Arduino              |
| <b>Week 4</b> | Lab 4: Creation of Things Speak Account                     |
| <b>Week 5</b> | Lab 5: Actuator Controlling Through Cloud                   |
| <b>Week 6</b> | Lab 6: Dht11sensor Data To Cloud                            |
| <b>Week 7</b> | Lab 7: Iot Based Air Pollution Control System               |
| <b>Week 8</b> | Lab 8: Tds Sensor Interfacing With Arduino                  |
| <b>Week 9</b> | Lab 9: Actuator Controlling by Mobile Using Arduino         |

| Learning and Teaching Resources |                                                                                                                                                                                                                                                                   |                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                                                                                                                   |                           |
|                                 | Text                                                                                                                                                                                                                                                              | Available in the Library? |
| Required Texts                  | <ul style="list-style-type: none"> <li>"The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)</li> <li>Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"</li> </ul> |                           |
| Recommended Texts               | <ul style="list-style-type: none"> <li>Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress,</li> </ul>                                                                                                                                 |                           |
| Websites                        | Cisco Netacad course " Introduction to IoT" <a href="#">Learn Key Concepts With Introduction To IoT Course   Networking Academy (netacad.com)</a>                                                                                                                 |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                              |                  |                     |           |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                                |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                       | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                                 | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                             | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                                      | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                  |                     |           |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                  |                     |           |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                           |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                           |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Information Theory and coding             |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                                      |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4101                                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 6                                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 150                                       |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                                         | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                                       | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mohammad Safa Jawad                       | e-mail                        | mohamm.ad@outlook.com                                                                                                                                                                                                                    |
| Module Leader's Acad. Title        | Asst. Lec.                                | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                                    |
| Module Tutor                       |                                           |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               |      | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |
|----------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |
|                                                          |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>101. To develop problem solving skills and understanding of information theory through the application of techniques.</p> <p>102. To understand the information representation.</p> <p>103. This course deals with the basic concept of source coding.</p> <p>104. To represent the information depending on the probabilities of events.</p> <p>105. To compress the data by various types of compression.</p> <p>106. To detect and correct the errors using channel coding methods.</p>                                                                                                                                                                                                                                                            |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>65. Having a skill to calculate the probability of any event.</p> <p>66. Modeling the information transmission system.</p> <p>67. Defined the information of noisy channel and posteriori probabilities.</p> <p>68. Representation the information source based on Shannon .</p> <p>69. Measure the information using entropies.</p> <p>70. Represent various types of channel model.</p> <p>71. Measure the entropy for various distribution methods.</p> <p>72. Having a skill of modeling various types of channels as a matrix.</p> <p>73. Measure the capacity of various types channels.</p> <p>74. Improve the data rate using various types of source code algorithms.</p> <p>75. Having a basic skill of error detection and corrections</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><u>Part A – Information theory</u></p> <p>Random variable, Shannon representation method, entropy, Information transmission system. Source entropy, Marginal Entropy. [20hrs]</p> <p><u>Part B – Channels</u></p> <p>Types of channel model, channel matrix, Channel capacity. [20 hrs]</p> <p><u>Part C – Source Coding</u></p> <p>Fixed and variable length code, types of source code, measure of code efficiency, data compression, [25hrs]</p> <p><u>Part d – Channel Coding</u></p> <p>Need for channel code, redundancy data, block code, convolutional codes</p> <p>Revision problem classes for each above classes [20 hrs]</p>                                                            |

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.73 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 4, 12      | LO #1-3, LO #4-9          |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 3, 12      | LO # 1,2 , LO#3-8         |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous |                           |
|                             | <b>Report</b>          | 1           | 10% (10)         | 13         | LO # 1-10                 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 10         | LO # 1-6                  |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|                         |
|-------------------------|
| <b>Material Covered</b> |
|-------------------------|

|                |                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Review of related probability and statistics related topics.                                                                                                                 |
| <b>Week 2</b>  | Model of information transmission system. Common sense definition of information<br>Logarithmic measure of information. Self-information.                                    |
| <b>Week 3</b>  | Shannon representation diagram of information source. Parameters of discrete channel.                                                                                        |
| <b>Week 4</b>  | Average information (entropy) of a discrete and continuous source, maximum source entropy. Source efficiency                                                                 |
| <b>Week 5</b>  | Transition probability matrix of channel, discrete noiseless and noisy channel models, uniform channel. Ternary symmetric channel.                                           |
| <b>Week 6</b>  | Information transmission over symmetric channel, noiseless channel, binary symmetric channel, ternary symmetric channel.                                                     |
| <b>Week 7</b>  | Memory and memory less information channels .Binary Erasure channel (BEC).                                                                                                   |
| <b>Week 8</b>  | Capacity of discrete channel, channel capacity for noiseless channel. Channel efficiency and redundancy. Channel capacity for symmetric channels.                            |
| <b>Week 9</b>  | Sampling of continuous source. Sampling Theorem. Nyquist theorem for transmission over band limited continuous channel. Shannon-Hartly channel capacity theorem.             |
| <b>Week 10</b> | <b>Midterm Exam</b>                                                                                                                                                          |
| <b>Week 11</b> | Source encoding; fixed and variable length codes. Prefix property. Average length of source code. Source code efficiency and redundancy. Fano coding, Shannon- Fano methods. |
| <b>Week 12</b> | Huffman code, data compression                                                                                                                                               |
| <b>Week 13</b> | Channel Coding in Digital Communication Systems. Forward Error Correction (FEC)                                                                                              |
| <b>Week 14</b> | Block codes. Cyclic Redundancy Check (CRC)                                                                                                                                   |
| <b>Week 15</b> | Repetition Codes, Single Parity Check Codes                                                                                                                                  |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | <b>Material Covered</b>                     |
|---------------|---------------------------------------------|
| <b>Week 1</b> | Lab 1: Self information measurements        |
| <b>Week 2</b> | Lab 2: Entropy measuring for multi-messages |
| <b>Week 3</b> | Lab 3: Mutual information measurements.     |
| <b>Week 4</b> | Lab 4: Various channel representation.      |
| <b>Week 5</b> | Lab 5: Losses channel measurements          |
| <b>Week 6</b> | Lab 6: Data Compression applications        |
| <b>Week 7</b> | Lab 7: Channel losses measurements          |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|  | <b>Text</b> | <b>Available in the Library?</b> |
|--|-------------|----------------------------------|
|--|-------------|----------------------------------|

|                          |                                                                                                                                                                                               |     |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Required Texts</b>    | Thomas M. Cover, Joy A. Thomas, Elements of Information Theory, John Wiley & Sons, Inc. 1991                                                                                                  | Yes |
| <b>Recommended Texts</b> | Coding Theory: Algorithms, Architectures, and Applications, Andreu Neubbauer, John Wiley & Sons, 2007                                                                                         | No  |
| <b>Websites</b>          | <a href="https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering">https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering</a> |     |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM



## نموذج وصف المادة الدراسية

| Module Information                 |                             |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                             |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Computer Networks Protocols |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                        |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4102                     |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 6                           |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 150                         |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                           | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                         | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Hussein Safa                | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        | Asst. Lec.                  | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                       |                             | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud  | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                  | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |                              |          |   |
|-----------------------------------|------------------------------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |                              |          |   |
| Prerequisite module               | Computer Network fundamental | Semester | 6 |
| Co-requisites module              | None                         | Semester |   |

### Module Aims, Learning Outcomes and Indicative Contents

| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 107. Prepare network engineers who can prepare and design all types of networks.<br>108. This course teaches modern and advanced curricula in the field of computer networks.<br>109. Providing high-quality modern research that can be applied in the field of computer networks and the Internet.<br>110. Provides appropriate solutions to the problems of design and installation of networks and choose the best protocols.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 76. Enable the students to apply their knowledge and skills in the field of computer networks to find practical solutions to any problems in this field and to be able to make appropriate decisions in the field of work.<br>77. Summarize the OSI model with all functions and objectives.<br>78. Discuss the protocols of each layer and its function and work.<br>79. Describe the network algorithms in the entire OSI model.<br>80. Describe the errors in networking communication.<br>81. Identify the solution for routing and forwarding in the network.<br>82. Discuss the explain the security of the network.<br>83. Discuss the protocols that deal with routing and security.<br>84. Explain the TCP/IP model and its relationship with the OSI model<br>85. Analyze, discuss, and use Network test results in the design and evaluation topology processes. |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p><u>Part A – OSI Network Model</u></p> <p>Layering model. functions of each layer, Services, general view of each protocol in each layer, and functions of each protocol regarding each layer. [15 hrs]</p> <p>Physical layer and transmission, Data link layer and Errors, Algorithms of data link layers. [15 hrs]</p> <p>The network layer of the OSI model, Function and services, Routing Algorithm, protocol algorithm, and application, network failure and delay, [15 hrs]</p> <p>Error's function, Network failure, and solutions. [10 hrs]</p> <p>Revision problem classes [6 hrs]</p> <p><u>Part B – Protocols of OSI model</u></p>                                                                                                                                                                          |

|  |                                                                                                                                                                                                                                                                                                 |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Protocol of each layer in details, function and services, experimental application [15 hrs]</p> <p>Switching routing. Components and experimental switching and algorithms. [7 hrs]</p> <p>The transport layer, functions protocols, protocols application, and flow experiment. [5 hrs]</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the simulation experiment, and tutorial lectures while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving networking activities that are interesting to the students.</p> |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.7  |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                |                       |                 |                          |
|---------------------------------------------------|----------------|-----------------------|-----------------|--------------------------|
|                                                   | <b>Time/Nu</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning</b> |

|                      |                 | Number |                  |            | Outcome          |
|----------------------|-----------------|--------|------------------|------------|------------------|
| Formative assessment | Quizzes         | 2      | 10% (10)         | 5, 10      | LO #1-3, LO #3-7 |
|                      | Assignments     | 2      | 20% (10)         | 3, 12      | LO # 1-3, LO#3-8 |
|                      | Projects / Lab. | 1      | 10% (10)         | Continuous |                  |
| Summative assessment | Midterm Exam    | 2 hr   | 10% (10)         | 7          | LO # 1-4         |
|                      | Final Exam      | 4hr    | 50% (50)         | 16         | All              |
| Total assessment     |                 |        | 100% (100 Marks) |            |                  |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|         | Material Covered                                                                                                                                                      |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1  | Protocol Hierarchies in OSI model: (Application layer, presentation layer, session layer, transport layer, network layer, datalink layer. Physical layer) basics. PDU |
| Week 2  | Physical Layer Protocols, Protocol Design Issues, Transmission, and Multiplexing<br>Protocol Functionality, Layering, and Framework (SP3)                             |
| Week 3  | Link layer: Services Provided by the Link Layer, Multiple Access Links and HDLC Protocols, Taking-turns protocols,                                                    |
| Week 4  | Link layer Error control and flow control algorithms<br>MAC Protocols (Ethernet, DSL, ISDN, FDDI) ; CSMA/CD                                                           |
| Week 5  | <b>Link layer:</b> Types of errors, Checksum algorithms CRC, MAC, Switch, ARP, L2TP, PPP<br><b>Network Layer</b> Protocols, Concepts, and Routing Algorithms.         |
| Week 6  | <b>Network Layer Protocols</b> - OSPF routing, EIGRP routing Rip, BGP, ICMP, DHCP                                                                                     |
| Week 7  | <b>Midterm Exam</b>                                                                                                                                                   |
| Week 8  | Network Protocols: RIP, BGP, ICMP, and DHCP. <b>Network layer components</b> Routing Algorithms (LS, DV)                                                              |
| Week 9  | IP (Internet Protocol), IP Datagram Fragmentation<br>IPv4, IPv6, IPsec                                                                                                |
| Week 10 | Transport Layer Protocols Design<br>Congestion Control, Flow Control- Services                                                                                        |
| Week 11 | MUX, DMUX, Connectionless, Connection Oriented.<br>TCP/UDP Analysis and Implementation                                                                                |
| Week 12 | <b>Presentation Protocols:</b> Security Protocols (SSL, SSH)                                                                                                          |
| Week 13 | Application Layer Protocols (Architecture, services)                                                                                                                  |
| Week 14 | Protocols: WWW (HTTP, HTTPS, FTP, DHCP,)                                                                                                                              |
| Week 15 | <b>TCP/ IP Model &amp; Protocols Stack</b>                                                                                                                            |

|                                                                         |                                                                     |
|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|                                                                         | Electronic Mail Protocols (SMTP, POP)<br>DNS, Telnet protocols      |
| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                     |
|                                                                         | <b>Material Covered</b>                                             |
| <b>Week 1</b>                                                           | Lab 1: Introduction to Cisco packet tracer and configuration Review |
| <b>Week 2</b>                                                           | Lab 2: VLAN network                                                 |
| <b>Week 3</b>                                                           | Lab 3: Inter-VLAN Techniques                                        |
| <b>Week 4</b>                                                           | Lab 4: Static Routing Protocol                                      |
| <b>Week 5</b>                                                           | Lab 5: Dynamic Routing Protocol (RIP)                               |
| <b>Week 6</b>                                                           | Lab 6: Dynamic Routing Protocol (RIP)                               |
| <b>Week 7</b>                                                           | Lab 7: DHCP,                                                        |
| <b>Week 8</b>                                                           | Lab 8: HTTP,DNS Protocol                                            |
| <b>Week 9</b>                                                           | Lab 9: IPv6                                                         |
| <b>Week 10</b>                                                          | Lab 10: Router and Switch Security                                  |

|                                                                 |                                                                                                                                                                                                     |                                  |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                                     |                                  |
|                                                                 | <b>Text</b>                                                                                                                                                                                         | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                           | <b>: Computer Networking A Top Down Approach.</b><br><b>Author :</b> James F. Kurose, Keith W. ross<br><b>Edition/Publisher/year :</b> 6 <sup>th</sup> , 7 <sup>th</sup> edition /Pearson 2013,2018 | Yes                              |
| <b>Recommended Texts</b>                                        | Internetworking with TCP/IP<br>Author : Douglas E. corner                                                                                                                                           | No                               |
| <b>Websites</b>                                                 | <a href="https://www.coursera.org/browse/physical-science-and-engineering/">https://www.coursera.org/browse/physical-science-and-engineering/</a>                                                   |                                  |

|                                       |                      |                |                  |                         |
|---------------------------------------|----------------------|----------------|------------------|-------------------------|
| <b>Grading Scheme</b><br>مخطط الدرجات |                      |                |                  |                         |
| <b>Group</b>                          | <b>Grade</b>         | <b>التقدير</b> | <b>Marks (%)</b> | <b>Definition</b>       |
| <b>Success Group</b>                  | <b>A - Excellent</b> | امتياز         | 90 - 100         | Outstanding Performance |

|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |         |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|---------|---------------------------------------|
| <b>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>B - Very Good</b>    | جيد جدا             | 80 - 89 | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>C - Good</b>         | جيد                 | 70 - 79 | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>D - Satisfactory</b> | متوسط               | 60 - 69 | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>E - Sufficient</b>   | مقبول               | 50 - 59 | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                              | <b>FX – Fail</b>        | راسب (قيد المعالجة) | (45-49) | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>F – Fail</b>         | راسب                | (0-44)  | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |         |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                         |                     |         |                                       |

## MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |                           |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |                           |
| Module Title                       | Mobile Communications   |                               | Module Delivery                                                                                                                                                                                                                          |                           |
| Module Type                        | Core                    |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                           |
| Module Code                        | CET4103                 |                               |                                                                                                                                                                                                                                          |                           |
| ECTS Credits                       | 6                       |                               |                                                                                                                                                                                                                                          |                           |
| SWL (hr/sem)                       | 150                     |                               |                                                                                                                                                                                                                                          |                           |
| Module Level                       | 4                       | Semester of Delivery          |                                                                                                                                                                                                                                          | 7                         |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |                           |
| Module Leader                      | Ali Abbas Al-Sabbagh    |                               | e-mail                                                                                                                                                                                                                                   | Aalsabbagh2014@my.fit.edu |
| Module Leader's Acad. Title        | Lecturer                | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |                           |
| Module Tutor                       |                         |                               |                                                                                                                                                                                                                                          |                           |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein | e-mail                        | osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |                           |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |                           |

| Relation with other Modules       |                        |          |   |
|-----------------------------------|------------------------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |                        |          |   |
| Prerequisite module               | Digital Communications | Semester | 5 |
| Co-requisites module              | None                   | Semester |   |

| Module Aims, Learning Outcomes and Indicative Contents   |  |
|----------------------------------------------------------|--|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |  |
|                                                          |  |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>It is aimed at students on the fourth stage definition</p> <ul style="list-style-type: none"> <li>- Concepts and terminology used in cellular systems</li> <li>- The study of developments in the generation cellular system</li> <li>- How to design cells</li> <li>- How to cover all the cell by signal and at all spaces</li> <li>- Types of modulation signal in Cellular Communications</li> <li>- Wireless systems construction, design and processing of interference signals</li> <li>- explain Multiple Access Techniques</li> </ul>                                                                                                                                                                                    |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1- Identify concepts and terms used in cellular systems</li> <li>2- Explain the signal analysis and how coverage in each cell</li> <li>3- compare between all generations and how they evolve</li> <li>4 Explain the internal structural study of the cells</li> <li>5- Discuss the Hand off Strategies</li> <li>6- Design cellular system</li> <li>7- Discuss the how to cover the signal to all the cells</li> <li>8- Explain how can small number of channels can accommodate large number of random users</li> <li>9- Design, planning and analysis of the signals for sending and receiving</li> <li>10 explain Modulate a digital signal and demodulation as Multiple Access</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>- <b>Introduction to Wireless Communication System ( 10 hr )</b></li> <li>- <b>The Cellular Concept-System Design Fundamentals ( 24 hr)</b></li> <li>- <b>Traffic Engineering (10 hr)</b></li> <li>- <b>Large scale path loss ( 15 hr)</b></li> <li>- <b>Multiple Access Techniques ( 15 hr)</b></li> </ul>                                                                                                                                                                                                                                                                                                                                 |



## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.73 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |      |

## Module Evaluation

### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 1           | 10% (10)         | 3          | LO #1- 3                  |
|                             | <b>Assignments</b>     | 1           | 10% (10)         | 12         | LO #1- 9                  |
|                             | <b>Projects / Lab.</b> | 10          | 10% (1)          | Continuous | LO #1-10                  |
|                             | <b>Report</b>          | 10          | 10% (1)          | Continuous | LO #1-10                  |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 8          | LO # 1-6                  |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|               | Material Covered                                                         |
|---------------|--------------------------------------------------------------------------|
| <b>Week 1</b> | Evolution of mobile communications, Mobile Radio System around the world |

|                |                                                                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 2</b>  | Types of Wireless communication System                                                                                                                  |
| <b>Week 3</b>  | Trend in Cellular radio and personal communication, 1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> , 4 <sup>th</sup> , 5 <sup>th</sup> generations |
| <b>Week 4</b>  | Cellular system, Hexagonal geometry cell and concept of                                                                                                 |
| <b>Week 5</b>  | frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio                                                                        |
| <b>Week 6</b>  | Channel & co-channel interference reduction factor,                                                                                                     |
| <b>Week 7</b>  | S/I ratio consideration and calculation for Minimum Co-channel and adjacent interference                                                                |
| <b>Week 8</b>  | <b>Midterm Exam</b>                                                                                                                                     |
| <b>Week 9</b>  | Handoff Strategies .Trucking and Grade of Service,                                                                                                      |
| <b>Week 10</b> | Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization                                                                     |
| <b>Week 11</b> | Free Space Propagation loss equation, Path-loss of NLOS and LOS systems,                                                                                |
| <b>Week 12</b> | Link budget design                                                                                                                                      |
| <b>Week 13</b> | Frequency Division Multiple Access (FDMA). Time Division Multiple Access (TDMA).                                                                        |
| <b>Week 14</b> | Wi-Fi, WiMAX, ZigBee Networks                                                                                                                           |
| <b>Week 15</b> | Software Defined Radio, UWB Radio                                                                                                                       |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                                                                           |
|---------------|------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | Introduction to Digital Communications-BPSK Modulation ,                                                   |
| <b>Week 2</b> | QPSK modulation, 16 QAM Modulation                                                                         |
| <b>Week 3</b> | Implement Communication System Compute the system's BER & Computing the Symbol Error Rate (cellular terms) |
| <b>Week 4</b> | Wireless link , path loss calculation                                                                      |
| <b>Week 5</b> | Link budget design                                                                                         |
| <b>Week 6</b> | Frequency Division Multiple Access (Multiplexing & DeMultiplexing)                                         |
| <b>Week 7</b> | Time Division Multiple Access( Multiplexing & DeMultiplexing)                                              |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                       | Text                               | Available in the Library? |
|-----------------------|------------------------------------|---------------------------|
| <b>Required Texts</b> | - Mischa Schwartz, Mobile Wireless | No                        |

|                          |                                                                           |    |
|--------------------------|---------------------------------------------------------------------------|----|
|                          | Communications, Cambridge University Press<br>2005                        |    |
| <b>Recommended Texts</b> | - J. G. Proakis, Digital Communications, 4th ed.<br>NY: McGraw Hill, 2000 | No |
| <b>Websites</b>          |                                                                           |    |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                 |                                     |                      |                                                                                                                                                                                                                                          |                       |
|------------------------------------|-------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| معلومات المادة الدراسية            |                                     |                      |                                                                                                                                                                                                                                          |                       |
| Module Title                       | Engineering Management              |                      | Module Delivery                                                                                                                                                                                                                          |                       |
| Module Type                        | S                                   |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                       |
| Module Code                        | CET4104                             |                      |                                                                                                                                                                                                                                          |                       |
| ECTS Credits                       | 5                                   |                      |                                                                                                                                                                                                                                          |                       |
| SWL (hr/sem)                       | 125                                 |                      |                                                                                                                                                                                                                                          |                       |
| Module Level                       | 4                                   | Semester of Delivery |                                                                                                                                                                                                                                          |                       |
| Administering Department           | CET                                 | College              | EETC                                                                                                                                                                                                                                     |                       |
| Module Leader                      | Falah Hasan Abdulsadah              |                      | e-mail                                                                                                                                                                                                                                   | falahsci@gmail.com    |
| Module Leader's Acad. Title        | lecturer                            |                      | Module Leader's Qualification                                                                                                                                                                                                            | PhD                   |
| Module Tutor                       |                                     |                      | e-mail                                                                                                                                                                                                                                   |                       |
| Peer Reviewer Name                 | Asst. Prof. Alhamzah Taher Mohammed |                      | e-mail                                                                                                                                                                                                                                   | alhamza_tm@mtu.edu.iq |
| Scientific Committee Approval Date | 29/10/2023                          |                      | Version Number                                                                                                                                                                                                                           | 1.0                   |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                         |
|----------------------------------------------------------|-------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                         |
| Module Aims<br>أهداف المادة الدراسية                     | 111. Knowledge of the main concepts and elements of project management. |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>112. Knowing the ways to draw network diagrams for projects</p> <p>113. Knowledge and understanding of the linear programming process for engineering projects</p> <p>114. Knowing the methods of calculating the cost per unit of production and finding the break-even point.</p> <p>115. Knowing the Economics for the engineers.</p> <p>116. To understand the Productivity.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>86. List the element of engineering management.</p> <p>87. Define the Economics for the engineers</p> <p>88. Drawing the Gantt Chart.</p> <p>89. Knowing how to draw network diagrams for the project.</p> <p>90. Knowledge of project critical path finding, project total tolerance, early and late start, the early and late end of the activities in the project.</p> <p>91. Define Project Evaluation and Review Technique (PERT).</p> <p>92. Identify standard deviation and variants.</p> <p>93. Crashing of project network.</p> <p>94. Knowing and understanding the Linear programming: graphical method</p> <p>95. Knowing, understanding linear programming: simplex method.</p> <p>96. Knowing, understanding and drawing the break-even point of the project.</p> <p>97. Knowing the Productivity</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b>Introduction of management</b>, main elements of project management, steps/phases of project management, Economics for the engineers [10 hrs.]</p> <p><b>Gantt Chart, Networks</b>, activity on arrow, activity on anode [10 hrs.]</p> <p><b>Critical path method</b>, Cp, float, early start, early finish, late start, late finish(CPM) [10hrs]</p> <p><b>Pert technique(Time-Cost)</b> Pert technique Expected time, slack, standard deviation and variants, the probability, crashing of project [16 hrs.]</p> <p><b>Linear programming:</b> graphical method, Linear programming: simplex method [15 hrs.]</p> <p><b>The break-even point Productivity.</b> [10 hrs.]</p>                                                                                 |

### Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

|                   |                                                                                  |
|-------------------|----------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage |
|-------------------|----------------------------------------------------------------------------------|

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> <p>Daily evaluations- quarterly evaluations- finally evaluations- practical evaluations- presentation evaluations- attend daily- weekly reports.</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |     |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|-----|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4   |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |     |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|---------------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                                   |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                              | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1-4 , LO #5-9         |
|                                                   | Assignments     | 2           | 10% (10)         | 3, 12      | LO # 1,2, LO#3-10         |
|                                                   | Projects / Lab. | 1           | 10% (10)         | Continuous |                           |
|                                                   | Report          | 1           | 10% (10)         | 13         | LO # 1-12                 |
| Summative assessment                              | Midterm Exam    | 2 hr        | 10% (10)         | 7          | LO # 1-7                  |
|                                                   | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment                                  |                 |             | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                             |
|-------------------------------------------------------------------|-----------------------------|
|                                                                   | Material Covered            |
| Week 1                                                            | Introduction of management  |
| Week 2                                                            | Economics for the engineers |
| Week 3                                                            | Gantt Chart                 |
| Week 4                                                            | Networks                    |

|             |                                      |
|-------------|--------------------------------------|
| Week 5,6    | Critical path method(CPM)            |
| Week 7      | Mid-term Exam                        |
| Week 8,9,10 | Pert technique(Time-Cost)            |
| Week 11     | Linear programming: graphical method |
| Week 12,13  | Linear programming: simplex method   |
| Week 14     | The break-even point                 |
| Week 15     | Productivity                         |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|        | Material Covered                    |
|--------|-------------------------------------|
| Week 1 | Introduction to Microsoft Project   |
| Week 2 | Setup a New project                 |
| Week 3 | Creating a Calendar for the project |
| Week 4 | Adding tasks to the project         |
| Week 5 | Set up resources                    |
| Week 6 | Formatting and sharing a plan       |
| Week 7 | View and report project status      |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                   | Text                                                                                                                                           | Available in the Library? |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Required Texts    | J.R. Meredith and S.J. Mantel "Project Management", J. Wiley & Sons, 1995.                                                                     | No                        |
| Recommended Texts | Y. Bakouros and V. Kelessidis "Project management"<br>INNOREGIO: dissemination of innovation and knowledge management techniques, January 2000 | No                        |

|          |  |
|----------|--|
| Websites |  |
|----------|--|

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية



| Module Information                 |                            |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                            |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Artificial Intelligence    |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Elective                   |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4105                    |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                          | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                        | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      |                            | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        |                            | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                       |                            | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                 | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                    |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                    |
| <b>Module Aims</b><br>أهداف المادة الدراسية              | 1- Provides a comprehensive introduction to artificial intelligence (AI) and neural networks.<br>2- Learn the fundamentals of AI, including problem-solving, reasoning, knowledge representation, and machine-learning techniques. |

|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                      | <ul style="list-style-type: none"> <li>3- Study the various types of neural networks and their architectures.</li> <li>4- Demonstrate the applications in real-world scenarios.</li> <li>5- Gain hands-on experience in implementing and training neural networks using popular frameworks and tools.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية | <ul style="list-style-type: none"> <li>1- Understand the principles and theories underlying artificial intelligence.</li> <li>2- Explain the concepts of machine learning, including supervised, unsupervised, and reinforcement learning.</li> <li>3- Demonstrate proficiency in programming languages commonly used in AI and neural network applications.</li> <li>4- Understand the fundamental concepts and principles of artificial neural networks (ANNs).</li> <li>5- Explain the architecture and components of different types of ANNs,</li> <li>6- Design and implement neural network architectures for various tasks, such as classification, regression, and pattern recognition.</li> <li>7- Train and optimize neural networks using appropriate algorithms and techniques.</li> <li>8- Evaluate and compare the performance of different neural network models using appropriate evaluation metrics.</li> <li>9- Understand the limitations and challenges associated with training and deploying neural networks.</li> <li>10- including feedforward, recurrent, and convolutional neural networks.</li> <li>11- Optimize ANNs using appropriate algorithms and techniques, such as gradient descent and backpropagation.</li> <li>12- Explore the applications of ANNs in different fields.</li> </ul> |
| <b>Indicative Contents</b><br><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>1- Introduction to Artificial Intelligence [5 hrs]<br/>History and evolution of AI, AI applications and impact on society, AI problem-solving approaches.</li> <li>2- Machine Learning Fundamentals [5 hrs]<br/>Supervised, unsupervised, and reinforcement learning; Training, validation, and testing of machine learning models; Evaluation metrics for assessing model performance.</li> <li>3- Neural Networks Basics [25 hrs]<br/>Fundamentals of biological Neural Networks, basic principles of ANNs, and their early structures; Properties of ANN, advantages, and disadvantages; Types of learning rules, learning algorithms, training styles</li> <li>4- Neural Networks Algorithms [25 hrs]<br/>Hebb Network, Perceptron, and activation functions; Feedforward neural networks and backpropagation algorithm; Optimization algorithms (e.g., gradient descent)</li> <li>5- Introduction to Deep Learning and Convolutional Neural Networks [5 hrs]<br/>Introduction to deep learning; Convolutional neural networks (CNNs) and their</li> </ul>                                                                                                                                                                   |

|                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                        | architectures; Image classification and object recognition using CNNs.                                                                                                                                                                                                                                                                                                                                              |
| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Strategies</b>                                                      | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students. |

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

|                                                   |                        |                    |                       |                 |                                  |
|---------------------------------------------------|------------------------|--------------------|-----------------------|-----------------|----------------------------------|
| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |                    |                       |                 |                                  |
|                                                   |                        | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2                  | 10% (10)              | 4, 12           | LO #1-4 and 5-7                  |
|                                                   | <b>Assessment</b>      | 2                  | 10% (10)              | 5,10            | LO #1-3 and 4-8                  |
|                                                   | <b>Seminar</b>         | 1                  | 10% (10)              | Continuous      | All                              |
|                                                   | <b>Projects / Lab.</b> | 1                  | 10% (10)              | Continuous      | All                              |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr               | 10% (10)              | 9               | LO # 1-8                         |
|                                                   | <b>Final Exam</b>      | 4hr                | 50% (50)              | 16              | All                              |
| <b>Total assessment</b>                           |                        |                    | 100% (100 Marks)      |                 |                                  |

|                                                                   |                                         |
|-------------------------------------------------------------------|-----------------------------------------|
| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                         |
|                                                                   | <b>Material Covered</b>                 |
| <b>Week 1</b>                                                     | Introduction to Artificial Intelligence |

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| <b>Week 2</b>      | Machine Learning Fundamentals                                          |
| <b>Week 3</b>      | Fundamentals of Biological Neural Networks, and their early structures |
| <b>Week 4</b>      | Properties of ANN, advantages, and disadvantage                        |
| <b>Week 5</b>      | Network architectures, logic gates                                     |
| <b>Week 6</b>      | Types of learning rules, learning algorithms, training styles          |
| <b>Week 7</b>      | Hebb Net, Applications,                                                |
| <b>Week 8</b>      | Character recognition                                                  |
| <b>Week 9</b>      | Mid Term Exam                                                          |
| <b>Week 10</b>     | Perception: Architecture, Algorithm, Applications                      |
| <b>Week 11</b>     | Adaline: Architecture, Algorithm, Applications                         |
| <b>Week 12</b>     | Mdaline: Architecture, Algorithm                                       |
| <b>Week 13, 14</b> | Backpropagation Neural Network: Architecture, Algorithm, Applications  |
| <b>Week 15</b>     | Introduction to Deep Learning and Convolutional Neural Networks        |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                                                                               |
|---------------|----------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | McCulloch-Pitts neurons: Logic Functions                                                                       |
| <b>Week 2</b> | Hebb Net: Logic Functions (Binary input and output, Binary input and bipolar output, bipolar input and output) |
| <b>Week 3</b> | Hebb Net: Character recognition (Two-dimensional input pattern with different letters)                         |
| <b>Week 4</b> | Perceptron for different logic functions                                                                       |
| <b>Week 5</b> | Adaline for different logic functions                                                                          |
| <b>Week 6</b> | Backpropagation for different architecture: Logic gate                                                         |
| <b>Week 7</b> | Backpropagation for different architecture: real applications                                                  |
| <b>Week 8</b> | Image classification and object recognition using CNNs.                                                        |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|  | Text | Available in the Library? |
|--|------|---------------------------|
|  |      |                           |

|                          |                                                                                  |    |
|--------------------------|----------------------------------------------------------------------------------|----|
| <b>Required Texts</b>    | "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig. | No |
| <b>Recommended Texts</b> | -                                                                                | No |
| <b>Websites</b>          |                                                                                  |    |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Web Design              |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | E                       |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4106                 |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                       |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                     |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                       | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                     | College                       | EECT                                                                                                                                                                                                                                     |
| Module Leader                      |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        |                         | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                       |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein | e-mail                        | osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                             |
|----------------------------------------------------------|-----------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                             |
| Module Aims<br>أهداف المادة الدراسية                     | 117. This course will introduce students to the realm of web design. : page |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>composition, XHTML, CSS, web design and code validation.</p> <p>118. Students will cover the Web design/development process.</p> <p>119. Topics covered include basic and enhanced site structure, local and remote site management, and optimization of Web-site performance.</p> <p>120. Provides appropriate knowledge to web servers and browsers of the internet and network communication.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>98. Be able to use the HTML programming language, Resolves written HTML codes, Runs the page he/she has designed using HTML codes</p> <p>99. Create an Information Architecture document for a web site,</p> <p>100. Construct a web site that conforms to the web standards of today and includes e-commerce and web marketing.</p> <p>101. Publish the website to a remote server using FTP.</p> <p>102. Perform regular web site maintenance (test, repair and change).</p> <p>103. Uses Domain Name and services</p> <p>104. Be able to make changes on the Site.</p> <p>105. Updates on the site when needed</p> <p>106. Be able to use the Design Programs.</p> <p>107. Designs and publish websites.</p>                                                                                                                                                                                                                                                                                                                 |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><u>Part A – Web Designer</u></p> <p>Specific skills would be design-tools-of-choice, HTML, CSS, and light JavaScript., [10 hrs]</p> <p>Front End Developer. focused on HTML, CSS, JavaScript, and light backend work. The lack of "designer" concepts beyond the core technologies, for instance regression testing or performance. [10 hrs]</p> <p>Technology specific job titles "JavaScript Developer" or "JavaScript Engineer" for a job where that is primarily what needs to be done., [10 hrs]</p> <p>UI Designer, light on HTML and CSS skill, A synonym might be a Visual Designer. [10 hrs]</p> <p>UX Designer, studying and researching how people use a site. Then ushering changes for the better through the system and testing the results, [5 hrs]</p> <p><u>Part B – internet Architecture and publishing</u></p> <p>Interaction Designer, Primarily design, just like a UI Designer, but with specific focus on how things are used and moved. [10 hrs]</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                 |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Web Developer, This job is focused on back end work and working with languages specific to the web, like PHP, ASP, Ruby, Python, etc. Medium skill in database/server work [10 hrs]</p> <p>Full Stack Developer. The structural design of websites like the taxonomies, metadata, scheduling, and analysis of content. A synonym might be Information Architect. [8 hrs]</p> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>The course will combine guided core reading, a series of short individual tasks, synchronous and asynchronous discussions, group working, resource sharing and hands -on experience on website development. Tutor support will be provided throughout the course. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving Designing that are interesting to the students.</p> |

| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطالب موزع على (15) اسبوع</b> |     |                                                                            |      |
|----------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل         | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل   | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل                | 125 |                                                                            |      |

| <b>Module Evaluation</b><br><b>تقييم المادة الدراسية</b> |                    |             |                |          |                           |
|----------------------------------------------------------|--------------------|-------------|----------------|----------|---------------------------|
|                                                          |                    | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| <b>Formative assessment</b>                              | <b>Quizzes</b>     | 2           | 10% (10)       | 5, 10    | LO #1-3, LO# 3-8          |
|                                                          | <b>Assignments</b> | 2           | 10% (10)       | 3, 12    | LO #1,2, LO# 3-7          |



|                             |                        |      |                  |            |           |
|-----------------------------|------------------------|------|------------------|------------|-----------|
|                             | <b>Projects / Lab.</b> | 1    | 10% (10)         | Continuous | All       |
|                             | <b>Report</b>          | 1    | 10% (10)         | 13         | LO # 1-10 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr | 10% (10)         | 9          | LO # 1-6  |
|                             | <b>Final Exam</b>      | 4hr  | 50% (50)         | 16         | All       |
| <b>Total assessment</b>     |                        |      | 100% (100 Marks) |            |           |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|                | Material Covered                                                                                                                                                                                                                                                                                                                                                              |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | <b>Introduction to HTML :</b> Introduction to Internet programming, HTML language, Description and running through IE, How to write codes in HTML?, Headings, titles.<br>The body in HTML language, background colors, pages and breaks                                                                                                                                       |
| <b>Week 2</b>  | <b>Lists &amp; Tables in HTML language :</b> Ordered list and unordered list, creating table, table attributes and features, <b>Images :</b> Images , Combining paragraphs with table and images.                                                                                                                                                                             |
| <b>Week 3</b>  | <b>Forms in HTML I :</b> Command buttons, Textboxes and text areas, Checkboxes and                                                                                                                                                                                                                                                                                            |
| <b>Week 4</b>  | <b>Forms in HTML II :</b> Select lists in Forms, combining Forms with images and tables, Introduction to dynamic programming, client side versus server side                                                                                                                                                                                                                  |
| <b>Week 5</b>  | <b>Client-Side Programming and Server-Side Programming :</b> Client-Side Programming and Server-Side Programming, JavaScript, What is JavaScript, What JavaScript can do?, What JavaScript can't do?, The Script Tag, Handling older browsers, JavaScript Statements, Script statement execute, JavaScript data types, Variables, Data type conversion, browser events.       |
| <b>Week 6</b>  | <b>Arithmetic Operators :</b> Arithmetic operators, Comparison operators, Examples and solutions, <b>Control Structures (if statement, if-else statement), Loops (for loop), Functions, Function parameters</b>                                                                                                                                                               |
| <b>Week 7</b>  | <b>Window and Document objects :</b> Window and Document objects, the window object, creating window, properties and methods: window.status, window.alert, window.confirm, window.prompt                                                                                                                                                                                      |
| <b>Week 8</b>  | <b>Forms and Form elements :</b> Forms and Form elements, creating a form, form properties, text object, form object button object, checkbox object, Radio object, Select object,                                                                                                                                                                                             |
| <b>Week 9</b>  | <b>Midterm Exam</b>                                                                                                                                                                                                                                                                                                                                                           |
| <b>Week 10</b> | Test 2: functions, forms and dates , Passing form data to functions, Submitting forms, Strings, Math and Date, Examples and solutions. <b>Images and dynamic HTML : Images and dynamic HTML, the image object, interchanging images, prechaching images, creating image rollover, Examples and solutions.</b><br><b>The String object (in detail), Examples and solutions</b> |

|                |                                                                                                                                                                                                        |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 11</b> | <b>The events:</b> The event object, Event handler, Event properties, Window event-handler, layer event handler, mouse event handler, other event handlers                                             |
| <b>Week 12</b> | <b>Global functions:</b> Global functions and statements, eval(), escape(), isNaN(), number(), parseFloat(), parseInt(), string(), unescape(), unwatch(), watch()                                      |
| <b>Week 13</b> | <b>Data-Entry : Data-Entry validation, isEmpty(), isNumber(), isInteger(), isPosInteger</b><br><b>Test 3: Images, Strings, and Global functions String : The String object, Examples and solutions</b> |
| <b>Week 14</b> | JS frameworks                                                                                                                                                                                          |
| <b>Week 15</b> |                                                                                                                                                                                                        |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                       |
|---------------|--------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction Xhtml language                     |
| <b>Week 2</b> | Lab 2: web page design , opening, saving               |
| <b>Week 3</b> | Lab 3: text, font design implementation                |
| <b>Week 4</b> | Lab 4: color, image, implementation .                  |
| <b>Week 5</b> | Lab 5: list, groups, page division                     |
| <b>Week 6</b> | Lab 6: forms , linking pages, meta function ,hyperlink |
| <b>Week 7</b> | Lab 7: publishing and linking page with internet.      |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                | Available in the Library? |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | <b>The Complete Internet and World Wide Web Programming Training course</b><br>Author : Harry M.Deitel, Paul J. Deitel, Tom Nieto<br>Edition & Year public : Prentice Hall PTR,2000 | Yes                       |
| <b>Recommended Texts</b> | Java script : the definition Guide,<br><b>Author</b> :David Flanagan, O'Reilly Media<br><b>Edition &amp; Year public</b> : 5 <sup>th</sup> edition , 2006                           | No                        |
| <b>Websites</b>          | <a href="https://www.coursera.org/browse/physical-science-and-engineering/web">https://www.coursera.org/browse/physical-science-and-engineering/web</a>                             |                           |

### Grading Scheme

| مخطط الدرجات                        |                         |                     |           |                                       |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                    |                                           |                               |                                                                                                                                                                                                                                          |
|---------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية               |                                           |                               |                                                                                                                                                                                                                                          |
| Module Title                          | Distributed Computing & Systems           |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                           | E                                         |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                           | CET4107                                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                          | 5                                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                          | 125                                       |                               |                                                                                                                                                                                                                                          |
| Module Level                          | 4                                         | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department              |                                           | College                       |                                                                                                                                                                                                                                          |
| Module Leader                         |                                           | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title           |                                           | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                          |                                           | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                    | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval<br>Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                               |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                               |
| Module Aims<br>أهداف المادة الدراسية                     | 121. To introduce students to the fundamental problems, concepts, and approaches in the design and analysis of distributed computing systems. |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>122. To familiarize students with the stages of the distributed system design cycle, including system architecture, data and processes arrangements, naming, communication and coordination issues, existing distributed computing paradigms, techniques, and tools, and evaluating the effectiveness of distributed application systems for specific data, task, and user types.</p> <p>123. understand the evolution of the distributed computing from its early beginnings as multi-processor and multi-computer systems, to computer networks, to the emerging cloud, edge (fog, dew, mist) and heterogeneous computing environments</p> <p>124. explain and discuss basic principles and typical examples of real-world distributed systems such as NFS file-sharing system and the web.</p> <p>125. understand process migration or more specifically code migration and its role in achieving scalability of distributed system</p>                                                                 |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>108. State, prove and apply Shannon's sampling theorem know the widely used models of communication: Remote Procedure Call (RPC), and Message-Oriented Middleware (MOM).</p> <p>109. know basic principles of the RPC model and problems with achieving distribution transparency.</p> <p>110. understand the peculiarities of the high-level message-queuing model of process communication.</p> <p>111. know how to set up multicast facilities for data dissemination in distributed systems.</p> <p>112. understand traditional deterministic means of multicasting as well as probabilistic approaches.</p> <p>113. know the use of Domain Name System (DNS).</p> <p>114. know the way of using attributes assigned to an entity to resolve a description of an entity in distributed system.</p> <p>115. know basics of the security management including mechanisms to distribute cryptographic keys, add and remove users from a system, prove ownership to access specified resources, etc...</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><u>Introduction: Design goals</u></p> <p>Distributed systems consist of autonomous computers that work together to give appearance of a single coherent system. Design goals for distributed systems include sharing resources and ensuring openness. In addition, designers aim at hiding many of the intricacies related to distribution of processes, data and control. [10 hrs]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><u>Types of systems</u></p> <p>Different types of distributed systems exist which can be classified as being oriented towards supporting computations, information processing and pervasiveness. Distributed computing systems are typically deployed for high-performance applications often originating from parallel computing. Cloud computing goes beyond high-performance computing and also supports distributed systems found in traditional office environments. An emerging class of distributed systems is represented by pervasive computing environments, including mobile-computing systems as well as sensor-reach environments. [10 hrs]</p> <p><u>Architectures: Architectural styles. Middleware</u></p> <p>We can make a distinction between software architecture and system architecture. AN architectural style reflects the basic principle that is followed in organizing the interaction between the software components comprising a distributed system. Important styles include layering, object-based styles, resource-based styles, and styles in which handling events are prominent. [10 hrs]</p> <p><u>Communication: Foundations. RPC</u></p> <p>Communication between processes is essential for any distributed system. In traditional network applications, communication is often based on the low-level message-passing primitives offered by the transport layer. One of the most widely used abstractions is the Remote Procedure Call (RPC), that offers synchronous communication facilities, by which a client is blocked until the server has sent a reply. [10 hrs]</p> <p><u>Communication: Message-oriented &amp; Multicast communication</u></p> <p>Message-oriented middleware models generally offer persistent asynchronous communication, and are used where RPCs are not appropriate. An important class of communication protocols in distributed systems is multicasting. [10 hrs]</p> <p><u>Naming: Names, IDs. Flat naming</u></p> <p>Names are used to refer to entities. There are three types of names: an address, an identifier, and human-friendly names. Given these types, we make a distinction between flat naming, structured naming, and attribute-based naming. Systems for flat naming essentially need to resolve an identifier to the address of its associated entity. This can be done in different ways. [10 hrs]</p> <p><u>Fault tolerance</u></p> <p>Fault tolerance is defined as the characteristic by which distributed computing system can mask the occurrence and recovery from failures. Several types of failures</p> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|  |                                                                                                                                                                                                                                                                                                                                                          |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | exist. Redundancy is the key technique needed to achieve fault tolerance. When applied to processes, the notion of process groups becomes important. The real problem is that members of a process group need to reach consensus in the presence of various failures. Paxos is by now a well-established and highly robust consensus algorithm. [10 hrs] |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The assessment strategy for this module is designed to provide students with the opportunity to demonstrate the skills and knowledge as described in the learning outcomes. The written examination will assess the knowledge of terminology, concepts and theory of Distributed Computing & Systems, as well as the ability to analyze problems and new features of distributed computing systems to solve and predict effects. The laboratory experiments will evaluate the acquired technical skills and expertise required to apply these methods. |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks) | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|----------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)       | 5, 10      | LO #1-3, LO #3-6          |
|                             | <b>Assignments</b>     | 2           | 10% (10)       | 3, 12      | LO #1,2, LO #3-7          |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)       | Continuous | All                       |
|                             | <b>Report</b>          | 1           | 10% (10)       | 13         | LO # 1-7                  |

|                             |                     |      |                  |    |          |
|-----------------------------|---------------------|------|------------------|----|----------|
| <b>Summative assessment</b> | <b>Midterm Exam</b> | 2 hr | 10% (10)         | 9  | LO # 1-6 |
|                             | <b>Final Exam</b>   | 4hr  | 50% (50)         | 16 | All      |
| <b>Total assessment</b>     |                     |      | 100% (100 Marks) |    |          |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                                                                                                                                                                                                                                                         |
| <b>Week 1</b>                                                     | <b>Design goals</b><br>Distributed systems consist of autonomous computers that work together to give appearance of a single coherent system.                                                                                                                                                                                                                   |
| <b>Week 2</b>                                                     | <b>Architectures: System architecture. Example</b><br>There are many different organizations of distributed systems. Client-server architectures are often highly centralized.                                                                                                                                                                                  |
| <b>Week 3</b>                                                     | <b>Processes: Threads. Virtualization</b><br>Processes play a fundamental role in distributed systems as they form a basis for communication between different machines.                                                                                                                                                                                        |
| <b>Week 4</b>                                                     | Processes: Clients. Servers.                                                                                                                                                                                                                                                                                                                                    |
| <b>Week 5</b>                                                     | <b>Communication: Foundations. RPC</b>                                                                                                                                                                                                                                                                                                                          |
| <b>Week 6</b>                                                     | <b>Naming: Structured naming. Attribute-based naming</b>                                                                                                                                                                                                                                                                                                        |
| <b>Week 7</b>                                                     | Mid-term Exam                                                                                                                                                                                                                                                                                                                                                   |
| <b>Week 8</b>                                                     | <b>Coordination: Clock synchronization</b><br>There are various ways to synchronize clocks in a distributed system. All methods are based on exchanging clock values, while taking into account the time it takes to send and receive messages.                                                                                                                 |
| <b>Week 9</b>                                                     | <b>Midterm Exam</b>                                                                                                                                                                                                                                                                                                                                             |
| <b>Week 10</b>                                                    | <b>Coordination: Mutual exclusion. Election algorithms</b><br>An important class of synchronization algorithms is that of distributed mutual exclusion. These algorithms ensure that in a distributed collection of processes, at most one process at a time has access to a shared resource. Consistency and replication: Data-centric & Client-centric models |
| <b>Week 11</b>                                                    | Consistency and replication: Replica management. Consistency protocols                                                                                                                                                                                                                                                                                          |
| <b>Week 12</b>                                                    | Fault tolerance.                                                                                                                                                                                                                                                                                                                                                |
| <b>Week 13</b>                                                    | Security                                                                                                                                                                                                                                                                                                                                                        |
| <b>Week 14</b>                                                    | <b>Distributed System Models and Enabling Technologies</b>                                                                                                                                                                                                                                                                                                      |
| <b>Week 15</b>                                                    | <b>Parallel Programming Systems and Models</b>                                                                                                                                                                                                                                                                                                                  |



### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                                                           |
|---------------|--------------------------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to Distributed Systems. ( Build a Cluster )                            |
| <b>Week 2</b> | Lab 2: Distributed System Models and Enabling Technologies. ( Benchmarking )               |
| <b>Week 3</b> | Lab 3: Parallel Programming Systems and Models. (Map Reduce )                              |
| <b>Week 4</b> | Lab 4: Cloud Computing.                                                                    |
| <b>Week 5</b> | Lab 5: File systems & Networked file systems.                                              |
| <b>Week 6</b> | Lab 6: Optimizing Large Data Transfers over 100Gbps Wide Area Networks - Anupam Rajendran. |
| <b>Week 7</b> | Lab 7: Distributed Filesystems.                                                            |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                                    | Available in the Library? |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms, (Pearson Education).                                                                                                                                                                                           | No                        |
| <b>Recommended Texts</b> | George Coulouris, Jean Dollimore. Tim Kindberg: Distributed Systems concepts and design.                                                                                                                                                                                                | No                        |
| <b>Websites</b>          | <a href="https://www.youtube.com/watch?v=cQP8WApzIQQ&amp;list=PLrw6a1wE39_tb2fErI4-WkMbsvGQk9_UB&amp;ab_channel=MIT6.824%3ADistributedSystems">https://www.youtube.com/watch?v=cQP8WApzIQQ&amp;list=PLrw6a1wE39_tb2fErI4-WkMbsvGQk9_UB&amp;ab_channel=MIT6.824%3ADistributedSystems</a> |                           |

### Grading Scheme

مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |

|                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
|                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |  |  |  |  |

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

**Module Information**

| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                               |                        |
|------------------------------------|-------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Module Title                       | Professional Ethics     |                               | Module Delivery                                                                                                                                                                                                               |                        |
| Module Type                        | B                       |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                        |
| Module Code                        | MTU1008                 |                               |                                                                                                                                                                                                                               |                        |
| ECTS Credits                       | 2                       |                               |                                                                                                                                                                                                                               |                        |
| SWL (hr/sem)                       | 50                      |                               |                                                                                                                                                                                                                               |                        |
| Module Level                       | 4                       | Semester of Delivery          |                                                                                                                                                                                                                               | 7                      |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                          |                        |
| Module Leader                      | Manar Mahmood           |                               | e-mail                                                                                                                                                                                                                        | Manarr.hamad@gmail.com |
| Module Leader's Acad. Title        | Lecturer                | Module Leader's Qualification | PhD                                                                                                                                                                                                                           |                        |
| Module Tutor                       |                         |                               | e-mail                                                                                                                                                                                                                        |                        |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein | e-mail                        | osama.abbas@mtu.edu.iq                                                                                                                                                                                                        |                        |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                           |                        |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                             |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                             |
| Module Aims<br>أهداف المادة الدراسية                     | The module aims to:<br><br>1. To develop an understanding of the fundamental concepts and principles of engineering ethics. |

|                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                            | <ol style="list-style-type: none"> <li>To explore ethical theories and frameworks relevant to engineering practice and decision-making.</li> <li>To familiarize students with codes of ethics and professional conduct in the engineering field.</li> <li>To cultivate ethical decision-making skills and the ability to analyze and resolve ethical dilemmas in engineering.</li> <li>To promote awareness of social, environmental, and global dimensions of engineering ethics and their impact on professional practice.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية       | <p>By the end of the module, students should be able to:</p> <ol style="list-style-type: none"> <li>Demonstrate a comprehensive understanding of the principles and importance of engineering ethics in professional practice.</li> <li>Apply ethical theories, frameworks, and decision-making models to analyze and resolve ethical dilemmas in engineering.</li> <li>Evaluate the social, environmental, and global impact of engineering decisions and recognize the ethical responsibilities of engineers in these contexts.</li> <li>Comprehend the professional obligations and responsibilities of engineers, including codes of ethics and professional conduct.</li> <li>Reflect on personal ethical development, demonstrate ethical awareness, and engage in lifelong learning in the field of engineering ethics.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Indicative Contents</b><br><br>المحتويات الإرشادية                      | <ol style="list-style-type: none"> <li>Introduction to Engineering Ethics: [18 hrs.] <ul style="list-style-type: none"> <li>Definition and importance of engineering ethics.</li> <li>Ethical theories and frameworks in engineering.</li> <li>Codes of ethics and professional conduct.</li> </ul> </li> <li>Ethical Decision-Making: [18 hrs.] <ul style="list-style-type: none"> <li>Steps in ethical decision-making.</li> <li>Utilitarianism and consequentialist ethics.</li> <li>Deontological ethics and duty-based approaches.</li> </ul> </li> <li>Professional Responsibility and Accountability: [18 hrs.] <ul style="list-style-type: none"> <li>Professionalism and professional identity.</li> <li>Professional obligations and responsibilities.</li> <li>Ethical and legal aspects of professional practice.</li> </ul> </li> <li>Social and Environmental Impact of Engineering: [18 hrs.] <ul style="list-style-type: none"> <li>Engineering and sustainability.</li> <li>Environmental ethics and considerations.</li> <li>Social responsibility and stakeholder engagement.</li> </ul> </li> <li>Ethical Issues in Research and Innovation: [18 hrs.] <ul style="list-style-type: none"> <li>Research integrity and responsible conduct of research.</li> <li>Intellectual property rights and plagiarism.</li> <li>Ethical considerations in technological innovation.</li> </ul> </li> </ol> |
| <b>Learning and Teaching Strategies</b><br><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Strategies</b>                                                          | <p>The learning and teaching strategies for the module on Computer Principles and operating systems can include:</p> <ol style="list-style-type: none"> <li>Lectures and Presentations: The instructor delivers lectures and</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>presentations to provide theoretical knowledge and concepts related to engineering ethics. This helps students understand the fundamental principles and frameworks.</p> <ol style="list-style-type: none"><li>2. Case Studies and Discussions: Engaging students in analyzing real-world case studies allows them to apply ethical theories and decision-making models to practical situations. Discussions and group activities encourage critical thinking and ethical reasoning.</li><li>3. Ethical Dilemma Analysis: Presenting students with ethical dilemmas specific to engineering contexts enables them to identify and evaluate conflicting values and potential courses of action. This fosters ethical decision-making skills and ethical awareness.</li><li>4. Guest Speakers and Expert Sessions: Inviting guest speakers, such as experienced professionals or ethics experts, to share their insights and experiences enriches the learning process. These sessions provide practical perspectives and real-world examples.</li><li>5. Group Projects and Presentations: Assigning group projects related to engineering ethics encourages collaboration, research, and application of ethical principles. Students can explore specific topics, develop solutions, and present their findings, fostering critical thinking and communication skills.</li><li>6. Ethics Workshops and Debates: Organizing workshops and debates focused on ethical topics in engineering allows students to actively engage in discussions, explore different viewpoints, and develop their argumentation skills.</li><li>7. Ethical Reflection and Self-Assessment: Providing opportunities for students to reflect on their personal values, ethical beliefs, and professional aspirations promotes self-awareness and encourages students to align their actions with ethical principles.</li><li>8. Online Resources and Learning Platforms: Utilizing online resources, such as interactive modules, online discussions, and ethical case repositories, enhances accessibility to additional learning materials and facilitates self-paced learning.</li><li>9. Assessment Methods: Assessing students through assignments, quizzes, exams, and presentations ensures their understanding of ethical theories, decision-making models, and their ability to apply them in practical scenarios.</li><li>10. Field Visits and Industry Engagements: Organizing visits to engineering organizations or engaging with industry professionals allows students to observe ethical practices in real-world settings and understand the challenges and responsibilities faced by engineers.</li></ol> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

|                                                                                |    |                                                                           |      |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطلاب خلال الفصل       | 33 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطلاب أسبوعيا       | 2.2  |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 17 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 1.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطلاب خلال الفصل              | 50 |                                                                           |      |

### Module Evaluation

تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|----------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 5, 10    | LO #1, 2, and 3,4         |
|                             | <b>Assignments</b>     | 2           | 20% (10)         | 2, 12    | LO # 1,2 and 3,4          |
|                             | <b>Projects / Lab.</b> |             |                  |          |                           |
|                             | <b>Report</b>          | 1           | 10% (10)         | 14       | All                       |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hours     | 10% (10)         | 8        | LO # 1-4                  |
|                             | <b>Final Exam</b>      | 3 hours     | 50% (50)         | 16       | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |          |                           |

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|               | Material Covered                                                                                                                                                                                                                                  |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | Introduction to Engineering Ethics <ul style="list-style-type: none"> <li>Definition and importance of engineering ethics.</li> <li>Ethical theories and frameworks in engineering.</li> <li>Codes of ethics and professional conduct.</li> </ul> |
| <b>Week 2</b> | Ethical Decision-Making Models <ul style="list-style-type: none"> <li>Steps in ethical decision-making.</li> </ul>                                                                                                                                |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <ul style="list-style-type: none"> <li>Utilitarianism and consequentialist ethics.</li> <li>Deontological ethics and duty-based approaches.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Week 3</b>  | Professional Responsibility and Accountability <ul style="list-style-type: none"> <li>Professionalism and professional identity.</li> <li>Professional obligations and responsibilities.</li> <li>Ethical and legal aspects of professional practice.</li> </ul>                                                                                                                                                                                                                                                                                     |
| <b>Week 4</b>  | Social and Environmental Impact of Engineering <ul style="list-style-type: none"> <li>Engineering and sustainability.</li> <li>Environmental ethics and considerations.</li> <li>Social responsibility and stakeholder engagement.</li> </ul>                                                                                                                                                                                                                                                                                                        |
| <b>Week 5</b>  | Conflicts of Interest and Ethical Dilemmas <ul style="list-style-type: none"> <li>Identification and resolution of conflicts of interest.</li> <li>Ethical dilemmas in engineering practice.</li> <li>Balancing competing ethical considerations.</li> </ul>                                                                                                                                                                                                                                                                                         |
| <b>Week 6</b>  | Ethical Issues in Research and Innovation <ul style="list-style-type: none"> <li>Research integrity and responsible conduct of research.</li> <li>Intellectual property rights and plagiarism.</li> <li>Ethical considerations in technological innovation.</li> </ul>                                                                                                                                                                                                                                                                               |
| <b>Week 7</b>  | Engineering and Public Safety <ul style="list-style-type: none"> <li>Risk assessment and management in engineering.</li> <li>Safety standards and regulations.</li> <li>Whistleblowing and professional accountability.</li> </ul>                                                                                                                                                                                                                                                                                                                   |
| <b>Week 8</b>  | <ul style="list-style-type: none"> <li><b>Midterm Exam</b></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Week 9</b>  | Ethical Leadership and Professional Integrity <ul style="list-style-type: none"> <li>Ethical leadership in engineering organizations.</li> <li>Integrity and ethical behavior in the workplace.</li> </ul> Ethical implications of professional relationships.<br>Global and Cultural Perspectives in Engineering Ethics <ul style="list-style-type: none"> <li>Cultural relativism and ethical relativism.</li> <li>Cross-cultural communication and ethical challenges.</li> <li>Global engineering ethics and international standards.</li> </ul> |
| <b>Week 10</b> | Ethical Issues in Emerging Technologies <ul style="list-style-type: none"> <li>Ethical considerations in artificial intelligence.</li> <li>Biomedical ethics and emerging medical technologies.</li> <li>Ethical challenges in nanotechnology and genetic engineering.</li> </ul>                                                                                                                                                                                                                                                                    |
| <b>Week 11</b> | Ethical Responsibilities to Clients and Customers <ul style="list-style-type: none"> <li>Professional obligations to clients and customers.</li> <li>Confidentiality and privacy in engineering practice.</li> <li>Fair competition and avoiding conflicts of interest.</li> </ul>                                                                                                                                                                                                                                                                   |
| <b>Week 12</b> | Ethical Responsibilities to Colleagues and Society <ul style="list-style-type: none"> <li>Respect for colleagues and teamwork ethics.</li> <li>Ethical implications of social media and online interactions.</li> <li>Public engagement and outreach in engineering.</li> </ul>                                                                                                                                                                                                                                                                      |
| <b>Week 13</b> | Ethical Issues in Engineering Management <ul style="list-style-type: none"> <li>Ethical challenges in project management.</li> <li>Ethical responsibilities of engineering managers.</li> <li>Corporate social responsibility and ethical business practices.</li> </ul>                                                                                                                                                                                                                                                                             |
| <b>Week 14</b> | Professional Development and Ethical Awareness <ul style="list-style-type: none"> <li>Lifelong learning and ethical competence.</li> <li>Continuing education and professional ethics.</li> </ul>                                                                                                                                                                                                                                                                                                                                                    |

|                |                                                                                                                                                                                                                                                                                         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <ul style="list-style-type: none"> <li>Ethical challenges in a rapidly changing technological landscape.</li> </ul>                                                                                                                                                                     |
| <b>Week 15</b> | Case Studies and Ethical Reflection <ul style="list-style-type: none"> <li>Analysis of real-world engineering ethics case studies.</li> <li>Ethical reflection and self-assessment.</li> <li>Final project or examination on engineering ethics principles and applications.</li> </ul> |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                    | Available in the Library? |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | C. E. C. E. Harris Jr., M. S. Pritchard, and M. J. Rabins, "Engineering Ethics: Concepts and Cases," Cengage Learning, 2018. [Online]. Available: ISBN: 978-1305500846. | Yes                       |
| <b>Recommended Texts</b> | M. W. Martin and R. Schinzinger, "Ethics in Engineering," McGraw-Hill Education, 2016. [Online]. Available: ISBN: 978-0078112481.                                       | No                        |
| <b>Websites</b>          | The Collage E-Library                                                                                                                                                   |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b>                   | <b>FX</b> - Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |



|          |          |      |        |                                      |
|----------|----------|------|--------|--------------------------------------|
| (0 - 49) | F - Fail | راسب | (0-44) | Considerable amount of work required |
|          |          |      |        |                                      |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                 |                            |                               |                                                                                                                                                                                                                                          |                           |
|------------------------------------|----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| معلومات المادة الدراسية            |                            |                               |                                                                                                                                                                                                                                          |                           |
| Module Title                       | Fiber Optics Communication |                               | Module Delivery                                                                                                                                                                                                                          |                           |
| Module Type                        | Core                       |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                           |
| Module Code                        | CET4201                    |                               |                                                                                                                                                                                                                                          |                           |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                          |                           |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                          |                           |
| Module Level                       | 4                          | Semester of Delivery          |                                                                                                                                                                                                                                          | 8                         |
| Administering Department           | CET                        | College                       | EETC                                                                                                                                                                                                                                     |                           |
| Module Leader                      | Ali Abbas Al-Sabbagh       |                               | e-mail                                                                                                                                                                                                                                   | Aalsabbagh2014@my.fit.edu |
| Module Leader's Acad. Title        | Lecturer                   | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |                           |
| Module Tutor                       |                            |                               |                                                                                                                                                                                                                                          |                           |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein    |                               | e-mail                                                                                                                                                                                                                                   | osama.abbas@mtu.edu.iq    |
| Scientific Committee Approval Date | 29/10/2023                 | Version Number                | 1.0                                                                                                                                                                                                                                      |                           |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                        |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                        |
| Module Aims<br>أهداف المادة الدراسية                     | 126. In this course, the students can acquire the basic knowledge of Optical Communication Systems<br>127. Optical Communication Media |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>128. Fiber optics communication principles and their application.</p> <p>129. Students will be learned about high-speed single-mode and low-speed multimode fiber,</p> <p>130. Students can acquire knowledge of step and graded refractive index profiles, different dispersion mechanisms and their effect on high-speed links,</p> <p>131. The advantage of coherent (LASER) light sources over incoherent (LED) sources for the long haul, high-speed links, and photodetectors.</p> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>116. Discuss Laser Principles , operation , structures , applications</p> <p>117. Describe Photodiodes</p> <p>118. Explain the Optical Communication Media</p> <p>119. Identify optical fiber waveguides</p> <p>120. Explain the of optical fiber communication</p> <p>121. Describe Transmission characteristics of optical fibers</p> <p>122. Discuss Optical Transmitters - transmitter types , design</p> <p>123. Explain Optical Amplifiers</p>                                     |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p>Basic Concepts of Optical Communication Systems (6 hr)</p> <p>Light Emitting Diodes (6 hr)</p> <p>Photodiodes (6 hr)</p> <p>Optical Communication Media (12 hr)</p> <p>Transmission characteristics of optical fibers (12 hr)</p> <p>Optical Fiber waveguides, couplers and connectors (12hr)</p> <p>Optical Transmitters (8 hr)</p> <p>Optical receivers (8 hr)</p> <p>Optical Amplifiers (4 hr)</p>                                  |

| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                          | <p>Skills competency is important as theory knowledge, especially in vocational and technical education. Thus, the aim of this module is to develop the students conceptual knowledge and skills in optical fiber communication to equip the students</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | with the necessary skills to become competent and skillful Technologists. lecture and seminars will be used to explain the theory and principles of the module. Also, laboratory reports and mini-projects will be used. Quantitative instruments such as pre-test and post-test will be used to check students' conceptual knowledge of electrical measurement after the theory lecture or laboratories work. Video will be used to explain the electrical measurement instruments. Observation form and laboratory rubric will be used to analyze the skills of the students. The observer comments from the laboratory staff on student skills will be classified according to thematic analysis to evaluate students learned skills. |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Student Workload (SWL)                                                         |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| الحمل الدراسي للطالب موزع على (15) اسبوع                                       |     |                                                                            |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| Module Evaluation     |                |             |                  |            |                           |
|-----------------------|----------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |                |             |                  |            |                           |
|                       |                | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes        | 2           | 10% (5)          | 3, 9       | LO #1, 2, LO#3-6          |
|                       | Assignments    | 2           | 10% (5)          | 5, 13      | LO #1- 3, LO#3-7          |
|                       | Project / Lab. | 1           | 10% (10)         | Continuous | All                       |
|                       | Report         | 1           | 10% (10)         | 13         | LO # 1-7                  |
| Summative assessment  | Midterm Exam   | 2 hr        | 10% (10)         | 7          | LO # 1-6                  |
|                       | Final Exam     | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment      |                |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                 |
|---------------------------------|-------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                 |
|                                 | Material Covered                                |
| Week 1                          | Basic Concepts of Optical Communication Systems |
| Week 2                          | Light Behavior                                  |

|                |                                                                                                                                      |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 3</b>  | Laser Principles                                                                                                                     |
| <b>Week 4</b>  | Light Emitting Diodes ( LEDs) - principle of operation , structures , applications                                                   |
| <b>Week 5</b>  | Laser Diodes LDs- principle of operation , structures , applications                                                                 |
| <b>Week 6</b>  | Photodiodes - ( pin Photodiode , Avalanche Photodiode , comparisons of photodetectors                                                |
| <b>Week 7</b>  | <b>Mid-term Exam</b>                                                                                                                 |
| <b>Week 8</b>  | Optical Communication Media- Overview of optical communication media, free space optical communication, optical fiber waveguides.    |
| <b>Week 9</b>  | Overview of optical fiber communication- general system, advantages, disadvantages, and applications of optical fiber communication  |
| <b>Week 10</b> | optical fiber waveguides, Ray theory, cylindrical fiber, single mode fiber, multi-mode fiber, cutoff wavelength, mode field diameter |
| <b>Week 11</b> | Transmission characteristics of optical fibers- Attenuation, absorption, scattering losses, bending loss, dispersion                 |
| <b>Week 12</b> | Fiber couplers and connectors                                                                                                        |
| <b>Week 13</b> | Optical Transmitters - transmitter types , design                                                                                    |
| <b>Week 14</b> | Optical Receivers - receivers types , design                                                                                         |
| <b>Week 15</b> | Optical Amplifiers                                                                                                                   |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|                | <b>Material Covered</b>                          |
|----------------|--------------------------------------------------|
| <b>Week 1</b>  | Lab 1: Introduction to Fiber Optics              |
| <b>Week 2</b>  | Lab 2: Fiber Cleaving                            |
| <b>Week 3</b>  | Lab 3: Numerical Aperture of a Fiber             |
| <b>Week 4</b>  | Lab 4: Coupling into Fiber                       |
| <b>Week 5</b>  | Lab 5: Profile of Fundamental Mode               |
| <b>Week 6</b>  | Lab 6: High-Order Modes in Fiber                 |
| <b>Week 7</b>  | Lab 7: <b>Mid-term Exam</b>                      |
| <b>Week 8</b>  | Lab 8: Coupling and Propagation Loss - i         |
| <b>Week 9</b>  | Lab 9: Coupling and Propagation Loss - ii        |
| <b>Week 10</b> | Lab 10: Analog Communication Link - i            |
| <b>Week 11</b> | Lab 11: Analog Communication Link – ii           |
| <b>Week 12</b> | Lab 12: Digital Communication Link - i           |
| <b>Week 13</b> | Lab 13: Digital Communication Link - ii          |
| <b>Week 14</b> | Lab 14: A preparatory week before the Final Exam |
| <b>Week 15</b> | Lab 15: <b>Final Exam</b>                        |

| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                                                                                                            |                           |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                          | Text                                                                                                                                                       | Available in the Library? |
| Required Texts                                           | <b>Optical Communications Essentials, Gerd Keiser, The McGraw-Hill Companies.</b><br><b>Optical Fiber Communication – Gerd Keiser, 4th Ed., MGH, 2008.</b> | Yes                       |
| Recommended Texts                                        | <b>Handbook of Laser Technology and Applications , Colin E. Webb, Julian D. C. Jones</b><br><b>CRC Press</b>                                               | No                        |
| Websites                                                 |                                                                                                                                                            |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A - Excellent</b>    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B - Very Good</b>    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C - Good</b>         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D - Satisfactory</b> | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E - Sufficient</b>   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX – Fail</b>        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F – Fail</b>         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                              |                               |                                                                                                                                                                                                                                          |
|------------------------------------|------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                              |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Advanced Computer Technology |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                         |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4202                      |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                            |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                          |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                            | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                          | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mohammed Mohsin Ali          | e-mail                        | mohammed.mohsin.albyate@altuff.edu.iq                                                                                                                                                                                                    |
| Module Leader's Acad. Title        | Asst. Lec.                   | Module Leader's Qualification | MSc                                                                                                                                                                                                                                      |
| Module Tutor                       |                              | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud   | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                   | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                         |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                         |
| Module Aims                                              | The course aims to provide students information about :<br>1. The $\mu$ P and its architecture and the addressing modes |

|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية                                                | 2. Paging mechanism, Segment translation and Page translation<br>3 Cache memory, Cache organization, fully associative, Direct mapped and Set associative<br>4. Cache memory used for 80386<br>- Direct Maps<br>- Two-way set associative<br>5. Intel's Pentium and its Features<br>6. Pentium pro, Out of order execution<br>7. other Pentium processors, Core processor                                                   |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية | 1- an ability to apply knowledge of microprocessor Architecture. (High)<br>2- an ability to apply knowledge about 80386 The $\mu P$ (High)<br>3- an ability to apply knowledge about Paging mechanism, Segment translation and Page translation (High)<br>4- an ability to identify and calculate the addressing mode and physical address (High)<br>5- an ability to calculate the data and tag for cache (High)           |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                    | <b>-Introduction to the Microprocessor and Computer (5 hr)</b><br><b>-The <math>\mu P</math> 80386 architecture (14 hr)</b><br><b>-Protected mode memory addressing (10hr)</b><br><b>-Descriptor and page table entries(10 hr)</b><br><b>-Memory paging(10 hr)</b><br><b>-Paging mechanism(5 hr)</b><br><b>-A translation lookaside buffer (TLB) (10hr)</b><br><b>-Cache memory(10 hr)</b><br><b>-Intel's Pentium(5 hr)</b> |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |



|  |  |
|--|--|
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| Student Workload (SWL)                                                         |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| الحمل الدراسي للطالب موزع على (15) اسبوع                                       |     |                                                                            |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| Module Evaluation     |                 |             |                  |            |                           |
|-----------------------|-----------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |                 |             |                  |            |                           |
|                       |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1,2, LO#3,4           |
|                       | Assignments     | 2           | 10% (10)         | 2, 12      | LO #1,2, LO#3,4           |
|                       | Projects / Lab. | 1           | 10% (10)         | Continuous | All                       |
|                       | Report          | 1           | 10% (10)         | 13         | LO # 1-4                  |
| Summative assessment  | Midterm Exam    | 2 hr        | 10% (10)         | 8          | LO # 1-3                  |
|                       | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment      |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                          |
|                                 | Material Covered                                                                                                                                         |
| Week 1                          | Introduction to the Microprocessor and Computer                                                                                                          |
| Week 2                          | The $\mu$ p 80x86 and its architecture<br>Internal organization of $\mu$ p 80x86                                                                         |
| Week 3-4                        | The $\mu$ p 80386 architecture <ul style="list-style-type: none"> <li>Addressing mode</li> <li>Assembly language</li> <li>Memory segmentation</li> </ul> |
| Week 5-6                        | Protected mode memory addressing <ul style="list-style-type: none"> <li>Selectors and descriptors</li> </ul>                                             |

|         |                                                                                                                                                                                   |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | <ul style="list-style-type: none"> <li>Local and global descriptors tables</li> </ul>                                                                                             |
| Week 7  | <b>Descriptor and page table entries</b> <ul style="list-style-type: none"> <li>Program-invisible registers</li> <li>Illustrating local memory access.</li> </ul> <b>Examples</b> |
| Week 8  | <b>Midterm Exam</b>                                                                                                                                                               |
| Week 9  | <b>Memory paging</b><br><b>Virtual memory</b>                                                                                                                                     |
| Week 10 | <b>Paging mechanism</b> <ul style="list-style-type: none"> <li>Segment translation</li> <li>Page translation</li> </ul>                                                           |
| Week 11 | <b>A translation lookaside buffer (TLB)</b><br><b>Examples</b>                                                                                                                    |
| Week 12 | <b>Major changes in the 80386 <math>\mu p</math></b>                                                                                                                              |
| Week 13 | <b>Cache memory</b> <ul style="list-style-type: none"> <li>Cache organization</li> <li>Fully associative</li> <li>Direct mapped</li> <li>Set associative</li> </ul>               |
| Week 14 | <b>Cache memory used for 80386</b> <ul style="list-style-type: none"> <li>Direct Maps</li> <li>Two-way set associative</li> </ul>                                                 |
| Week 15 | <b>Intel's Pentium</b> <ul style="list-style-type: none"> <li>Features of the Pentium</li> <li>Intel's overdrive technology</li> </ul>                                            |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|        | Material Covered                                          |
|--------|-----------------------------------------------------------|
| Week 1 | Lab 1: Introduction to Mp 80386                           |
| Week 2 | Lab 2: programming using assembly language                |
| Week 3 | Lab 3: programming many functions                         |
| Week 4 | Lab 4: programming many functions using Assembly Language |
| Week 5 | Lab 5: Examples                                           |
| Week 6 | Lab 6: Examples                                           |

|               |                 |
|---------------|-----------------|
| <b>Week 7</b> | Lab 7: Examples |
|---------------|-----------------|

| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                          |                           |
|----------------------------------------------------------|------------------------------------------|---------------------------|
|                                                          | Text                                     | Available in the Library? |
| <b>Required Texts</b>                                    | The 80x86 IBM Pc and compatible computer | Yes                       |
| <b>Recommended Texts</b>                                 |                                          | No                        |
| <b>Websites</b>                                          |                                          |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                 |                                  |                            |                                                                                                                                                                                                                                          |                             |       |
|------------------------------------|----------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------|
| معلومات المادة الدراسية            |                                  |                            |                                                                                                                                                                                                                                          |                             |       |
| Module Title                       | Network Security & Cybersecurity |                            | Module Delivery                                                                                                                                                                                                                          |                             |       |
| Module Type                        | Core                             |                            | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                             |       |
| Module Code                        | CET4203                          |                            |                                                                                                                                                                                                                                          |                             |       |
| ECTS Credits                       | 5                                |                            |                                                                                                                                                                                                                                          |                             |       |
| SWL (hr/sem)                       | 125                              |                            |                                                                                                                                                                                                                                          |                             |       |
| Module Level                       |                                  | 4                          | Semester of Delivery                                                                                                                                                                                                                     |                             | 8     |
| Administering Department           |                                  | CET                        | College                                                                                                                                                                                                                                  | EETC                        |       |
| Module Leader                      | Salman Rasheed Owaid             |                            | e-mail                                                                                                                                                                                                                                   | Rasheed.salman161@gmail.com |       |
| Module Leader’s Acad. Title        |                                  | Lec.                       | Module Leader’s Qualification                                                                                                                                                                                                            |                             | Ph.D. |
| Module Tutor                       |                                  |                            | e-mail                                                                                                                                                                                                                                   |                             |       |
| Peer Reviewer Name                 |                                  | Dr. Mahmoud Shuker Mahmoud | e-mail                                                                                                                                                                                                                                   | mahmoud.shukur@mtu.edu.iq   |       |
| Scientific Committee Approval Date |                                  | 29/10/2023                 | Version Number                                                                                                                                                                                                                           |                             | 1.0   |

| Relation with other Modules       |      |  |          |
|-----------------------------------|------|--|----------|
| العلاقة مع المواد الدراسية الأخرى |      |  |          |
| Prerequisite module               | None |  | Semester |
| Co-requisites module              | None |  | Semester |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                    |
| Module Aims<br>أهداف المادة الدراسية                     | <p>Upon completion of this course you will have acquired the following knowledge:</p> <p>132. Understand hacking techniques.</p> <p>133. Understand the fundamentals of secure network design.</p> <p>134. Understand the issues involved with providing secure networks.</p> <p>135. Understand underlying cryptography required for secure communications, authorization and</p> |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>136. authorization.</p> <p>137. Obtain hands on experience in cryptography and network security through laboratory work</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>124. Students will be able to explain security principles.</p> <p>125. Develop Concept of Security needed in Communication of data through computers and networks along with Various Possible Attacks.</p> <p>126. Understand Various Encryption mechanisms for secure transmission of data and management of key required for required for encryption.</p> <p>127. Students will be able to evaluate risks faced by computer systems and how various attacks work.</p> <p>128. Students will be able to explain how various security mechanisms work, and correlate these security mechanisms with security principles.</p> <p>129. Students will be able to compare various security mechanisms and articulate their advantages and limitations.</p> <p>130. Understand authentication requirements and study various authentication mechanisms.</p> <p>131. Understand network security concepts and study different Web security mechanisms.</p> <p>132. Students will be able to create cybersecurity policies and procedures to help</p> <p>133. secure a medium-sized organization's information technology infrastructure.</p> <p>134. Students will understand the latest techniques hackers employ to test out cyber defenses.</p> <p>135. Students will analyze the mission and strategy of the Iraq government agencies who protect our portion of the Internet.</p> <p>136. Students will discuss hypothetical issues of cyber security with other students in the group Discussions format.</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><u>Security Concepts Overview</u></p> <p>Difference types of attacks; the reasons for protecting the personal information and commercially sensitive information; the types of encryptions; the advantages and limitations of encryption such as symmetric key and asymmetric key. [15 hrs]</p> <p><u>Security for Malware and Wearable Devices</u></p> <p>Definition and function of malware; types of malware; mobile malware; app security; Android/iOS security model; how anti-virus software works and its limitations. [15hrs]</p> <p><u>Network Security</u></p> <p>Difference types of network; the function and limitations of a firewall; Different types of wireless security (i.e. WEP and WPA2); access control. [15 hrs]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                        | <u>Web Security</u><br>Digital certificate; one-time password; appropriate settings of cookies; protect private data in browsers; types of content-control software. [15 hrs]<br><u>Communications</u><br>Encrypting and decrypting an e-mail; digital signature; unsolicited e-mail; phishing; backdoor access in instant messaging. [15 hrs]<br><u>Secure Data Management</u><br>Physical security; backup procedures; data destruction utilities. [14 hrs] |
| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.                                                                  |

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

|                                                   |                        |                    |                       |                 |                                  |
|---------------------------------------------------|------------------------|--------------------|-----------------------|-----------------|----------------------------------|
| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |                    |                       |                 |                                  |
|                                                   |                        | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 2                  | 10% (10)              | 5, 10           | LO #1-4, LO# 4-8                 |
|                                                   | <b>Assignments</b>     | 2                  | 10% (10)              | 3, 12           | LO #1,2, LO# 3-7                 |
|                                                   | <b>Projects / Lab.</b> | 1                  | 10% (10)              | Continuous      | All                              |
|                                                   | <b>Report</b>          | 1                  | 10% (10)              | 13              | LO # 1-11                        |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr               | 10% (10)              | 6               | LO # 1-4                         |
|                                                   | <b>Final Exam</b>      | 4hr                | 50% (50)              | 16              | All                              |
| <b>Total assessment</b>                           |                        |                    | 100% (100 Marks)      |                 |                                  |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                        |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|                                                                   | Material Covered                                                                                                       |
| <b>Week 1</b>                                                     | Introduction, Symmetric Ciphers model: plaintext, encryption algorithm, secret key, cipher text, decryption algorithm. |
| <b>Week 2</b>                                                     | Model of Conventional Encryption and Cryptography Classification.                                                      |
| <b>Week 3</b>                                                     | Affine Cipher and Polyalphabetic algorithm (Vigenere cipher).                                                          |
| <b>Week 4</b>                                                     | Cryptanalysis of a Symmetric key.                                                                                      |
| <b>Week 5</b>                                                     | Hill cipher and Play fair cipher. Stream Cipher                                                                        |
| <b>Week 6</b>                                                     | Mid-term Exam                                                                                                          |
| <b>Week 7</b>                                                     | Unit-Step Forcing, Forced Response, the RLC Circuit                                                                    |
| <b>Week 8</b>                                                     | DES—The Data Encryption Standard, hers -16 round.                                                                      |
| <b>Week 9</b>                                                     | Public-Key Algorithms, - RSA.                                                                                          |
| <b>Week 10</b>                                                    | Diffie Hellman Algorithm.                                                                                              |
| <b>Week 11</b>                                                    | Elgamal Algorithm.                                                                                                     |
| <b>Week 12</b>                                                    | Cyber Security Tools                                                                                                   |
| <b>Week 13</b>                                                    | Web Security.                                                                                                          |
| <b>Week 14</b>                                                    | Email Security.                                                                                                        |
| <b>Week 15</b>                                                    | PGP—Pretty Good Privacy and S/MIME.                                                                                    |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                                                                                           |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                         | Material Covered                                                                                                                          |
| <b>Week 1</b>                                                           | Lab 1: Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:<br>a) Caesar Cipher                      Playfair Cipher |
| <b>Week 2</b>                                                           | Lab 2: Implement the following algorithm :<br>a) Hill Cipher                      Vigenere Cipher                                         |
| <b>Week 3</b>                                                           | Lab 3: Implement the RSA Algorithm.                                                                                                       |
| <b>Week 4</b>                                                           | Lab 4: Implement the DES Algorithm.                                                                                                       |
| <b>Week 5</b>                                                           | Lab 5: Implement the Hash function SHA-1 Algorithm.                                                                                       |
| <b>Week 6</b>                                                           | Lab 6: Implement the SIGNATURE SCHEME - Digital Signature Standard.                                                                       |
| <b>Week 7</b>                                                           | Lab 7: Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w).                                              |

| Learning and Teaching Resources                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|---------------------------------------|
| مصادر التعلم والتدريس                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                         |                     |           |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      | Text                                                                                                                                                                                                                                                                    |                     |           | Available in the Library?             |
| Required Texts                                                                                                                                                                                                                                                                                                                                                                       | Stallings, W. (2016). Cryptography and network security: principles and practice (Eighth edition.). Pearson                                                                                                                                                             |                     |           | No                                    |
| Recommended Texts                                                                                                                                                                                                                                                                                                                                                                    | Speciner, M. et al. (2002). Network security: Private communication in a public world. (Second edition.).                                                                                                                                                               |                     |           | No                                    |
| Websites                                                                                                                                                                                                                                                                                                                                                                             | <a href="https://www.youtube.com/watch?v=0UMeUB1PIRo&amp;list=RDCMUcu1lQ7SJU27bRIL6h9r9A&amp;start_radio=1&amp;rv=0UMeUB1PIRo&amp;t=8">https://www.youtube.com/watch?v=0UMeUB1PIRo&amp;list=RDCMUcu1lQ7SJU27bRIL6h9r9A&amp;start_radio=1&amp;rv=0UMeUB1PIRo&amp;t=8</a> |                     |           |                                       |
| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                         |                     |           |                                       |
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                                                                                                                                                                                                                                                                   | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent                                                                                                                                                                                                                                                           | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good                                                                                                                                                                                                                                                           | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good                                                                                                                                                                                                                                                                | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory                                                                                                                                                                                                                                                        | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient                                                                                                                                                                                                                                                          | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail                                                                                                                                                                                                                                                               | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail                                                                                                                                                                                                                                                                | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                                                                                                                                                                                                                                                                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية



| Module Information                    |                                           |                               |                                                                                                                                                                                                                                          |
|---------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية               |                                           |                               |                                                                                                                                                                                                                                          |
| Module Title                          | Cloud Computing                           |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                           | Core                                      |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                           | CET4204                                   |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                          | 5                                         |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                          | 125                                       |                               |                                                                                                                                                                                                                                          |
| Module Level                          | 4                                         | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department              | CET                                       | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                         |                                           | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title           |                                           | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                          |                                           | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                    | Asst. Prof. Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval<br>Date | 29/10/2023                                | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                         |
| Module Aims                                              |                                                                                         |
| أهداف المادة الدراسية                                    | 138. To define the concept of hosting<br>139. To introduce the cloud-computing paradigm |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>140. To simplify the transition from bare-metal servers thinking to a cloud-native approach.</p> <p>141. To foster the automation and orchestration concepts.</p> <p>142. To design, build and manage private clouds.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>137. Classify cloud hosting types.</p> <p>138. Describe the data center infrastructure.</p> <p>139. Utilization of virtual machines</p> <p>140. Transition into virtual networking.</p> <p>141. Management of cloud infrastructure.</p> <p>142. Comprehension of cloud-storage</p> <p>143. Correct utilization of micro-services.</p> <p>144. Proper use of rate-limiting concepts.</p> <p>145. Understanding the concept of security.</p> <p>146. Understanding the concept of privacy.</p> <p>147. Capability to diagnose bottlenecks in cloud-based systems.</p> <p>148. Proper application of concepts of elasticity in production systems.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following:</p> <p><b>-Cloud Computing History</b> – Power wall, Cloud Computing physical component and organization, cloud computing services. [5 hr.s]</p> <p><b>-Cloud Computing types</b> – Private and Public Cloud, Hybrid and Multi-Cloud, Hyperscale's, and Cloud server selection. [5 hr.s]</p> <p><b>-Data Centers</b> – Racks, aisles, Pods, Cloud networking and power management, North-South and East-West Networks, Fat Tree design, leaf-spine scaling. [5 hr.s]</p> <p><b>-VM and Containers</b> – Virtualization, Hypervisor, Container and Docker software components. [5 hr.s]</p> <p><b>-Virtual Network and Virtual Storage</b> – Overlays and Underlays, VLANs and VXLANs, SDN and OpenFlow Protocol, Programmable Network. [10 hrs.]</p> <p><b>-consensus</b> – Need of agreement in cloud-based systems, types, challenges. [10 hrs.]</p> <p><b>-Cloud-storage</b>– traditional vs software designed storage. [5 hr.s]</p> <p><b>-Microservices</b>- Monolithic Apps in Data Centers, The Microservices Approach: Pros and Cons, Microservices Granularity, Communication Protocols for Microservices, Service Mesh Proxy, Microservices Technologies. [5 hr.s]</p> <p><b>-Serverless Computing</b> – The serverless Computing Approach, Stateless Servers and Containers, Serverless Infrastructure, an Example of Serverless Processing. [10 hr.s]</p> |

|  |                                                                                                                                                                                                                            |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>-Edge Computing and IoT</b> - The Latency Disadvantage of Cloud, Low Latency Needs, Extending Edge to A Fog Hierarchy, Multi-level Caching, Edge computing and IIoT, Communication of IIoT, Decentralization. [10 hr.s] |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process. |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                    |             |                |          |                           |
|---------------------------------------------------|--------------------|-------------|----------------|----------|---------------------------|
|                                                   |                    | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>     | 2           | 10% (10)       | 6, 12    | LO #1-3, LO #3-8          |
|                                                   | <b>Assignments</b> | 2           | 10% (10)       | 8, 13    | LO # 1-5, LO#5-10         |

|                             |                        |      |                  |            |           |
|-----------------------------|------------------------|------|------------------|------------|-----------|
|                             | <b>Projects / Lab.</b> | 1    | 10% (10)         | Continuous | All       |
|                             | <b>Report</b>          | 1    | 10% (10)         | 14         | LO # 1-11 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr | 10% (10)         | 9          | LO # 1-6  |
|                             | <b>Final Exam</b>      | 4hr  | 50% (50)         | 16         | All       |
| <b>Total assessment</b>     |                        |      | 100% (100 Marks) |            |           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المناهج الاسبوعي النظري |                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                                                                                                                                                                                          |
| <b>Week 1</b>                                                     | <b>The Era of Cloud Computing:</b> The Motivations for Cloud, Power wall, Racks of Server Computer, Elastic Computing, Multi-tenant Clouds, IaaS, PaaS, SaaS, and DaaS.                                                                                                                          |
| <b>Week 2</b>                                                     | <b>Types of Clouds and its Providers:</b> Private and Public Cloud, Provider Lock-in, Hybrid Cloud, Multi-Cloud, Hyperscale.                                                                                                                                                                     |
| <b>Week 3</b>                                                     | <b>Data Center Infrastructure and Equipment:</b> Racks, Aisles, and Pods, Power and Cooling, Network Equipment, North-South and East-West Network Traffic, Fat tree Design, leaf spine scaling, Unified Data Centers Network.                                                                    |
| <b>Week 4</b>                                                     | <b>Virtual Machines and Containers:</b> Approaches To virtualization, Properties of Virtualization, Level of Trust and I/O devices, VM Migration, Hypervisor. Container approach, Docker Containers, Docker software components.                                                                 |
| <b>Week 5</b>                                                     | <b>Virtual Networks and Virtual Storage:</b> Virtual Networks, Overlay and Underlays, VLANs, VXLAN, Virtual Network Switch, NAT, Mobility, SDN, The OpenFlow Protocol, Programmable Networks. Local and Remote Storage, NAS, SAN, Object Storage.                                                |
| <b>Week 6</b>                                                     | <b>Consensus:</b> Raft, Paxos, consistency levels, CAP, theorem.                                                                                                                                                                                                                                 |
| <b>Week 7</b>                                                     | <b>Software :</b> Cloud native vs. Conventional Software, Parallel Processing, MapReduce Programming Paradigm, Math of MapReduce, Apache Hadoop, HDFS, Hadoop support for Programming languages.                                                                                                 |
| <b>Week 8</b>                                                     | <b>Microservices:</b> Monolithic Apps in Data Centers, The Microservices Approach: Pros and Cons, Microservices Granularity, Communication Protocols for Microservices, Service Mesh Proxy, Microservices Technologies.                                                                          |
| <b>Week 9</b>                                                     | Mid-term-1                                                                                                                                                                                                                                                                                       |
| <b>Week 10</b>                                                    | <b>Cloud Storage:</b> File, Object, Database storage systems, Software Defined Storage                                                                                                                                                                                                           |
| <b>Week 11</b>                                                    | <b>Serverless Computing and DevOps:</b> The serverless Computing Approach, Stateless Servers and Containers, Serverless Infrastructure, An Example of Serversles Processing. DevOps Approach, Continuous Integration, Continuous Delivery, Caucious Deployment, Sandbox, Canary, and Blue/Green. |
| <b>Week 12</b>                                                    | <b>Edge Computing and IoT:</b> The Latency Disadvantage of Cloud, Low Latency Needs, Extending Edge to A Fog Hierarchy, Multi-level Caching, Edge computing and IIoT, Communication of IIoT, Decentralization.                                                                                   |
| <b>Week 13</b>                                                    | <b>Cloud Security and Privacy:</b> Cloud Security Problems, Traditional Security Methods and its insufficiency with cloud, Zero Trust Security Model, Identity Management, PAM, AI and Security, Protecting Remote Access, Privacy in Cloud, Back Doors, Side Channels.                          |
| <b>Week 14</b>                                                    | <b>Building Your Own Cloud:</b> Case Study, see TextBook#2                                                                                                                                                                                                                                       |

|                |                                                           |
|----------------|-----------------------------------------------------------|
| <b>Week 15</b> | <b>Building Your Own SaaS:</b> Case Study, see TextBook#2 |
|----------------|-----------------------------------------------------------|

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                          |
|-------------------------------------------------------------------------|----------------------------------------------------------|
|                                                                         | Material Covered                                         |
| <b>Week 1</b>                                                           | Lab 1: hosting providers portal mgmt.                    |
| <b>Week 2</b>                                                           | Lab 2: hosting specs and pricing                         |
| <b>Week 3</b>                                                           | Lab 3: virtualization software (installation, config)    |
| <b>Week 4</b>                                                           | Lab 4-5: VM mgmt.                                        |
| <b>Week 5</b>                                                           |                                                          |
| <b>Week 6</b>                                                           | Lab 6: backup, recovery, scaling, up down.               |
| <b>Week 7</b>                                                           | Lab 7-8: Proxmox mgmt                                    |
| <b>Week 8</b>                                                           |                                                          |
| <b>Week 9</b>                                                           | Lab 9: migration offline, online, hypervisor replacement |
| <b>Week 10</b>                                                          | Lab 10-11-12: docker mgmt                                |
| <b>Week 11</b>                                                          |                                                          |
| <b>Week 12</b>                                                          |                                                          |
| <b>Week 13</b>                                                          | Mgmt. tools                                              |
| <b>Week 14 &amp; 15</b>                                                 | Virtual appliances                                       |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                                                        |                           |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                                                                                                                                                                                                                                   | Available in the Library? |
| <b>Required Texts</b>                                           | <b>Textbooks</b><br><b>Book#1:</b> Douglas E. Comer, The Cloud Computing Book, The future of Computing Explained, 1st Edition, CRC Press, 2021.<br><b>Book#2:</b> Ian Foster and Dennis B. Gannon, "Cloud Computing for Science and Engineering", The MIT Press, 2017. | Yes                       |

|                   |  |    |
|-------------------|--|----|
|                   |  |    |
| Recommended Texts |  | No |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                         |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                         |                               |                                                                                                                                                                                                                                          |
| Module Title                       | project                 |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core                    |                               | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input checked="" type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4205                 |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                       |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                     |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                       | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                     | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        |                         | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                       | Dr. Osama Abbas Hussein | e-mail                        | Osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Peer Reviewer Name                 |                         | e-mail                        |                                                                                                                                                                                                                                          |
| Scientific Committee Approval Date | 29/10/2023              | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |  |
|----------------------------------------------------------|--|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |  |
| Module Aims<br>أهداف المادة الدراسية                     |  |
| Module Learning                                          |  |

|                                                     |  |
|-----------------------------------------------------|--|
| <b>Outcomes</b><br>مخرجات التعلم للمادة<br>الدراسية |  |
|                                                     |  |
| <b>Indicative Contents</b><br>المحتويات الإرشادية   |  |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.</p> |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب موزع على (15) اسبوع      |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 62  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.13 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 63  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.2  |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                 |             |                |          |                           |
|---------------------------------------------------|-----------------|-------------|----------------|----------|---------------------------|
|                                                   |                 | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | Quizzes         |             |                |          |                           |
|                                                   | Assignments     |             |                |          |                           |
|                                                   | Projects / Lab. |             |                |          |                           |
|                                                   | Report          |             |                |          |                           |
| <b>Summative</b>                                  | Midterm Exam    | 2 hr        | 40% (10)       | 8        |                           |



|                  |            |     |                  |    |     |
|------------------|------------|-----|------------------|----|-----|
| assessment       | Final Exam | 2hr | 60% (50)         | 16 | All |
| Total assessment |            |     | 100% (100 Marks) |    |     |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                        |
|-------------------------------------------------------------------|----------------------------------------|
|                                                                   | Material Covered                       |
| Week 1                                                            |                                        |
| Week 2                                                            |                                        |
| Week 3                                                            |                                        |
| Week 4                                                            |                                        |
| Week 5                                                            |                                        |
| Week 6                                                            |                                        |
| Week 7                                                            |                                        |
| Week 8                                                            |                                        |
| Week 9                                                            |                                        |
| Week 10                                                           |                                        |
| Week 11                                                           |                                        |
| Week 12                                                           |                                        |
| Week 13                                                           |                                        |
| Week 14                                                           |                                        |
| Week 15                                                           |                                        |
| Week 16                                                           | Preparatory week before the final Exam |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                  |
|-------------------------------------------------------------------------|------------------|
|                                                                         | Material Covered |
| Week 1                                                                  |                  |
| Week 2                                                                  |                  |

|              |  |
|--------------|--|
| Week 3       |  |
| Week 4       |  |
| Week 5       |  |
| Week 6       |  |
| Week 7       |  |
| Week 8       |  |
| Week 9       |  |
| Week 10      |  |
| Week 11      |  |
| Week 12      |  |
| Week 13      |  |
| Week 14 & 15 |  |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                   | Text | Available in the Library? |
|-------------------|------|---------------------------|
| Required Texts    |      |                           |
| Recommended Texts |      |                           |

### Grading Scheme

مخطط الدرجات

| Group                       | Grade            | التقدير             | Marks (%) | Definition                            |
|-----------------------------|------------------|---------------------|-----------|---------------------------------------|
| Success Group<br>(50 - 100) | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                             | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                             | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                             | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                             | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 - 49)      | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                             | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |

|                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
|                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |  |  |  |  |

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                 |                                  |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                  |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Reconfigurable Computing Systems |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Elective                         |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4206                          |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                              |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                                | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                              | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      |                                  | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        |                                  | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                       |                                  | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Osama Abbas Hussein          | e-mail                        | osama.abbas@mtu.edu.iq                                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 29/10/2023                       | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                        |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                        |
| Module Aims<br>أهداف المادة الدراسية                     | 1. Understand the fundamentals of the reconfigurable computing and reconfigurable architectures<br>2. Articulate the design issues involved in reconfigurable computing systems with a |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>specific focus on Field Programmable Gate Arrays (FPGAs) both in theoretical and application levels</p> <p>3. Understand the performance trade-offs involved in designing a reconfigurable computing platform with a specific focus on the architecture of a configurable logic block and the programmable interconnect</p> <p>4. Discuss the state-of-the-art reconfigurable computing architectures spanning fine grained (look up table-based processing elements) to coarse grained (arithmetic logic unit level processing elements) architectures.</p> <p>5. Understand both how to architect reconfigurable systems and how to utilize them for solving challenging computational problems.</p>                                                                                                      |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. an ability to apply knowledge of mathematics, science, and engineering (High)</li> <li>2. an ability to design and conduct experiments, as well as to analyze and interpret data (High)</li> <li>3. an ability to design a system, component, or process to meet desired needs within realistic constraints (High)</li> <li>4. an ability to identify, formulate, and solve engineering problems (High)</li> <li>5. an ability to communicate effectively (Medium)</li> <li>6. a recognition of the need for, and an ability to engage in life-long learning (Medium)</li> <li>7. a knowledge of contemporary issues (High)</li> <li>8. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. (High)</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>--Introduction to Reconfigurable Computing (5 hr)</p> <p>--FPGA Architectures(10 hr)</p> <p>--FPGA Design Cycle (20 hr)</p> <p>--Coarse-grained Reconfigurable Devices (10 hr)</p> <p>--Reconfigurable Computing Applications (7 hr)</p> <p>--Multi-FPGA Systems (5 hr)</p> <p>--FPGAs vs. Multicore architectures (5 hr)</p> <p>--Advanced Topics (12 hr)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|  |                                                                                                                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Student Workload (SWL)                                                         |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| الحمل الدراسي للطالب موزع على (15) اسبوع                                       |     |                                                                           |      |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                           |      |

| Module Evaluation     |                 |             |                  |            |                           |
|-----------------------|-----------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |                 |             |                  |            |                           |
|                       |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1-3, LO#3-5           |
|                       | Assignments     | 2           | 10% (10)         | 2, 12      | LO #1-2, LO#3-6           |
|                       | Projects / Lab. | 1           | 10% (10)         | Continuous | All                       |
|                       | Report          | 1           | 10% (10)         | 13         | LO # 1-7                  |
| Summative assessment  | Midterm Exam    | 2 hr        | 10% (10)         | 9          | LO # 1-5                  |
|                       | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment      |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                          |
|---------------------------------|------------------------------------------|
| المنهاج الاسبوعي النظري         |                                          |
|                                 | Material Covered                         |
| Week 1                          | Introduction to Reconfigurable Computing |
| Week 2-3                        | FPGA Architectures                       |

|                   |                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 4-7</b>   | FPGA Design Cycle <ul style="list-style-type: none"> <li>• Technology-independent optimization</li> <li>• Technology Mapping</li> <li>• Placement</li> <li>• Routing</li> </ul> |
| <b>Week 8</b>     | Coarse-grained Reconfigurable Devices                                                                                                                                           |
| <b>Week 9</b>     | <b>Midterm Exam</b>                                                                                                                                                             |
| <b>Week 11</b>    | Reconfigurable Computing Applications                                                                                                                                           |
| <b>Week 12</b>    | Multi-FPGA Systems                                                                                                                                                              |
| <b>Week 13</b>    | FPGAs vs. Multicore architectures                                                                                                                                               |
| <b>Week 14-15</b> | Advanced Topics: <ul style="list-style-type: none"> <li>• Dynamic Reconfiguration</li> <li>• Partial Reconfiguration</li> <li>• 3D FPGAs</li> </ul>                             |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                 |
|---------------|--------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to ISE design suite software |
| <b>Week 2</b> | Lab 2: VHDL programming tools                    |
| <b>Week 3</b> | Lab 3: programming simple VHDL program           |
| <b>Week 4</b> | Lab 4: IF statements -VHDL programs              |
| <b>Week 5</b> | Lab 5: For loop -VHDL programs                   |
| <b>Week 6</b> | Lab 6: UP-Down counters                          |
| <b>Week 7</b> | Lab 7: Multi functions programs                  |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                       | Text                                                  | Available in the Library? |
|-----------------------|-------------------------------------------------------|---------------------------|
| <b>Required Texts</b> | : (Optional) Reconfigurable Computing: The Theory and | Yes                       |

|                          |                                                                                           |    |
|--------------------------|-------------------------------------------------------------------------------------------|----|
|                          | Practice of FPGA-Based Computation by Scott Hauck, André DeHon.                           |    |
| <b>Recommended Texts</b> | C. Maxfield, The Design Warrior's Guide to FPGAs, Newnes, 2004, ISBN: 978-0750676045      | No |
| <b>Websites</b>          | <a href="http://class.ece.iastate.edu/cpre583/">http://class.ece.iastate.edu/cpre583/</a> |    |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية



| Module Information                 |                                              |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                              |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Wireless Sensor Network                      |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Elective                                     |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4207                                      |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                            |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                                          |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                                            | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                                          | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      |                                              | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        |                                              | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                       |                                              | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Asst. Prof.<br>Alhamzah<br>Taher<br>Mohammed | e-mail                        | alhamza_tm@mtu.edu.iq                                                                                                                                                                                                                    |
| Scientific Committee Approval Date | 29/10/2023                                   | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |  |          |  |
|-----------------------------------|--|----------|--|
| العلاقة مع المواد الدراسية الأخرى |  |          |  |
| Prerequisite module               |  | Semester |  |
| Co-requisites module              |  | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |
|----------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |
|                                                          |

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | The aim of the course is to provide students with knowledge and skills for wireless network design, operation and testing, equipment configuration, security considerations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>By the end of the course, students will know:</p> <ol style="list-style-type: none"> <li>1- Electromagnetic signal specifications IEEE802.11 link layer protocol data rates, media access control and logical link control techniques, quality-of-service and security features</li> <li>2- Wireless network design principles.</li> <li>3- Perform wireless signal planning and strength measurement.</li> <li>4- Design wireless network with optimal performance.</li> <li>5- Plug-in and configure wireless network equipment.</li> <li>6- Build large wireless network with centralized control.</li> <li>7- Configure wireless network security</li> <li>8- The necessary skills to design, configure and operate production-grade wireless network.</li> </ol> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p><u>Part A – Introduction</u></p> <p>Introduction to WSNs, Wireless technology history, modern wireless networks, Advantages, Challenge vs Ad-hoc network. [25 hrs]</p> <p><u>Part B – Architecture</u></p> <p>Network architecture, node architecture, types of networks based on its topology, data transfer on media. [25 hrs]</p> <p><u>Part C – Wi-Fi Protocols</u></p> <p>IEEE 802.11 (Wi-Fi) protocol design. Wi-Fi physical layer, Wi-Fi data-link layer, Wi-Fi logical link control layer, Wi-Fi quality-of-service (QoS) features, Wi-Fi security features [25 hrs]</p>                                                                                                                                    |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |

| Student Workload (SWL)<br>الحمل الدراسي للطالب موزع على (15) اسبوع             |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

| Module Evaluation<br>تقييم المادة الدراسية |                 |             |                  |            |                           |
|--------------------------------------------|-----------------|-------------|------------------|------------|---------------------------|
|                                            |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment                       | Quizzes         | 2           | 10% (10)         | 4, 12      | LO #1-3, LO#3-7           |
|                                            | Assignments     | 2           | 10% (10)         | 5, 12      | LO #1-3, LO#4-7           |
|                                            | Projects / Lab. | 1           | 10% (10)         | Continuous |                           |
|                                            | Report          | 1           | 10% (10)         | 13         | LO # 1-8                  |
| Summative assessment                       | Midterm Exam    | 2 hr        | 10% (10)         | 9          | LO # 1-4                  |
|                                            | Final Exam      | 4hr         | 50% (50)         | 16         | All                       |
| Total assessment                           |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus)<br>المنهاج الاسبوعي النظري |                                                                                                                                                                          |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | Material Covered                                                                                                                                                         |
| Week 1- 2                                                  | Course introduction, wireless network introduction. Wireless technology history, modern wireless networks                                                                |
| Week 3-4                                                   | Data transfer over wireless media. Electromagnetic waves propagation. Wireless equipment and EM waves specifications. Data modulation and coding schemes, data decoding. |

|                   |                                                                                                                                                                         |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 5-6</b>   | IEEE 802.11 (Wi-Fi) protocol design. Wi-Fi physical layer: EM signal specifications, data rates, data modulation and coding schemes.                                    |
| <b>Week 7-8</b>   | Wi-Fi data-link layer: data frame structure, media access control, wireless nodes addressing, error detection/correction.                                               |
| <b>Week 9</b>     | <b>Midterm Exam</b>                                                                                                                                                     |
| <b>Week 10</b>    | Wi-Fi logical link control layer: data frame types, control and management frames, multiple network coexistence. Wireless network with multiple access points, roaming. |
| <b>Week 11-12</b> | Wi-Fi logical link control layer: data frame types, control and management frames, multiple network coexistence. Wireless network with multiple access points, roaming. |
| <b>Week 13</b>    | Wi-Fi security features. 802.1x protocol, WPA/2/3 operation. Network infrastructure security.                                                                           |
| <b>Week 14</b>    | Wi-Fi centralized architecture. Wireless controller configuration/operation                                                                                             |
| <b>Week 15</b>    | Decentralized Wi-Fi networks (Ad-Hoc, Mesh-type). Introduction to sensor networks. Bluetooth basics                                                                     |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | <b>Material Covered</b>                                                   |
|---------------|---------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Node construction.                                                 |
| <b>Week 2</b> | Lab 2: WSNs Topologies.                                                   |
| <b>Week 3</b> | Lab 3: IEEE 802.11 design.                                                |
| <b>Week 4</b> | Lab 4: Wi-Fi logical link.                                                |
| <b>Week 5</b> | Lab 5: Wi-Fi quality-of-service measurements.                             |
| <b>Week 6</b> | Lab 6: WSNs based on 802.1x protocol.                                     |
| <b>Week 7</b> | Lab 7: Configuring peer-to-peer network (Wi-Fi Ad-Hoc mode or Bluetooth). |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|  | <b>Text</b> | <b>Available in the Library?</b> |
|--|-------------|----------------------------------|
|  |             |                                  |

|                          |                                                                                                                                                                                                                                                                                                                                             |     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Required Texts</b>    | Wireless Sensor Network, Leonidas J. Guibas, The Morgan Kaufmann Series in Networking, Elsevier, NEW YORK                                                                                                                                                                                                                                   | Yes |
| <b>Recommended Texts</b> | Kazem Sohraby, Daniel Minoli and Taieb Znati, "Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.                                                                                                                                                                                                  | No  |
| <b>Websites</b>          | <a href="https://kanchiuniv.ac.in/coursematerials/ECE_COURSE_MATERIAL_ODD%20SEMESTER/ECE_COURSE%20MATERIAL_ODD%20SEMESTER/Dr.S.Omkumar_Wireless%20Sensor%20Networks.pdf">https://kanchiuniv.ac.in/coursematerials/ECE_COURSE_MATERIAL_ODD%20SEMESTER/ECE_COURSE%20MATERIAL_ODD%20SEMESTER/Dr.S.Omkumar_Wireless%20Sensor%20Networks.pdf</a> |     |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                 |                            |                               |                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                            |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Optimization Algorithms    |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Elective                   |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CET4208                    |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 4                          | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CET                        | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      |                            | e-mail                        |                                                                                                                                                                                                                                          |
| Module Leader's Acad. Title        |                            | Module Leader's Qualification |                                                                                                                                                                                                                                          |
| Module Tutor                       |                            | e-mail                        |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud | e-mail                        | mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                |
| Scientific Committee Approval Date | 29/10/2023                 | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                |
| <b>Module Aims</b><br>أهداف المادة الدراسية              | 1- Provides students with an introduction to optimization techniques and genetic algorithms.<br>2- Students will learn about various optimization problems, including linear and nonlinear optimization.<br>3- Explore the principles and applications of genetic algorithms.<br>4- Cover the fundamental concepts, algorithmic implementations, and practical |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>considerations for solving optimization problems using genetic algorithms.</p> <p>5- Students will gain hands-on experience through programming assignments and project work.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1- Understand the fundamental concepts and principles of optimization techniques.</li> <li>2- Explain the different types of optimization problems, including linear programming, nonlinear programming, and combinatorial optimization.</li> <li>3- Evolutionary Algorithms, Swarm Intelligence Algorithms.</li> <li>4- Understand the principles and workings of genetic algorithms.</li> <li>5- Advantages and disadvantages of Genetic algorithms.</li> <li>6- Population, selection, crossover, and mutation algorithms</li> <li>7- Design and implement genetic algorithms to solve optimization problems.</li> <li>8- Analyze and compare the performance of different optimization algorithms.</li> <li>9- Evaluate and select suitable optimization algorithms for specific problem domains.</li> <li>10- Implement optimization algorithms using programming languages and libraries commonly used in the field.</li> <li>11- Analyze and interpret the results obtained from optimization algorithms.</li> <li>12- Apply optimization techniques to real-world applications in various domains.</li> </ol>                                                                                                                                          |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1- Introduction to Optimization [5 hrs]<br/>Optimization problems and their classifications; Linear programming and integer programming; Nonlinear Optimization.</li> <li>2- Evolutionary Computation [5 hrs]<br/>Introduction to evolutionary computation; Swarm Intelligence Algorithms; Principles of genetic algorithms, advantages, and disadvantages.</li> <li>3- Genetic Algorithm Components [5 hrs]<br/>Representation and encoding of solutions; Selection, crossover, and mutation operators.</li> <li>4- Genetic Algorithm Operators and Strategies [25 hrs]<br/>Tournament selection, roulette wheel selection, and rank-based selection; Single-point crossover, uniform crossover, and arithmetic crossover; Mutation techniques and their impact on exploration and exploitation</li> <li>5- Genetic Algorithm Variants and Extensions [10 hrs]<br/>Elitism and population size selection; Adaptive and dynamic parameter settings</li> <li>6- Applications of Optimization and Genetic Algorithms [10 hrs]<br/>Optimization in engineering, operations research, and finance; Applications in scheduling, routing, and resource allocation; Real-world case studies and examples</li> </ol> |

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب موزع على (15) اسبوع

|                                                                                |     |                                                                            |      |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 4.26 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 61  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.06 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                            |      |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 5, 14      | LO #1-3 and 4-9           |
|                             | <b>Assessment</b>      | 2           | 10% (10)         | 4, 10      | LO #1-3 and 4-8           |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous | All                       |
|                             | <b>Seminar</b>         | 1           | 10% (10)         | Continuous | All                       |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 9          | LO # 1-7                  |
|                             | <b>Final Exam</b>      | 4hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|                 | Material Covered                                       |
|-----------------|--------------------------------------------------------|
| <b>Week 1</b>   | Introduction to optimization algorithms                |
| <b>Week 2,3</b> | Nature-inspired Optimization Techniques                |
| <b>Week 4,5</b> | Evolutionary Algorithms, Swarm Intelligence Algorithms |



|                   |                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------|
| <b>Week 6</b>     | Introduction to Genetic Algorithm                                                            |
| <b>Week 7</b>     | Advantages and disadvantages of Genetic algorithms                                           |
| <b>Week 8</b>     | Type of operators, population, selection, crossover, crossover rate, mutation, mutation rate |
| <b>Week 9</b>     | Mid Term Exam                                                                                |
| <b>Week 10,11</b> | Population, selection, crossover, and mutation algorithms                                    |
| <b>Week 12,13</b> | Applications of genetic algorithms                                                           |
| <b>Week 14,15</b> | Introduction to Particle swarm optimization (PSO)                                            |

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

|               | Material Covered                                      |
|---------------|-------------------------------------------------------|
| <b>Week 1</b> | Introduction to MATLAB: m file                        |
| <b>Week 2</b> | Benchmark functions                                   |
| <b>Week 3</b> | The initial population of the genetic algorithm       |
| <b>Week 4</b> | candidate solutions based on dimension and population |
| <b>Week 5</b> | Population Movement                                   |
| <b>Week 6</b> | Genetic algorithm implementation                      |
| <b>Week 7</b> | The real application of the genetic algorithm         |

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

|                          | Text                                                                                    | Available in the Library? |
|--------------------------|-----------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | "Introduction to Genetic Algorithms" by Melanie Mitchell.                               | No                        |
| <b>Recommended Texts</b> | "Introduction to the Theory of Optimization" by J.E. Dennis Jr. and Robert B. Schnabel. | No                        |
| <b>Websites</b>          | <a href="https://www.coursera.org">https://www.coursera.org</a>                         |                           |

### Grading Scheme

#### مخطط الدرجات

| Group                               | Grade                   | التقدير | Marks (%) | Definition                       |
|-------------------------------------|-------------------------|---------|-----------|----------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A - Excellent</b>    | امتياز  | 90 - 100  | Outstanding Performance          |
|                                     | <b>B - Very Good</b>    | جيد جدا | 80 - 89   | Above average with some errors   |
|                                     | <b>C - Good</b>         | جيد     | 70 - 79   | Sound work with notable errors   |
|                                     | <b>D - Satisfactory</b> | متوسط   | 60 - 69   | Fair but with major shortcomings |

|                                |                  |                     |         |                                       |
|--------------------------------|------------------|---------------------|---------|---------------------------------------|
|                                | E - Sufficient   | مقبول               | 50 - 59 | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b> | <b>FX – Fail</b> | راسب (قيد المعالجة) | (45-49) | More work required but credit awarded |
|                                | <b>F – Fail</b>  | راسب                | (0-44)  | Considerable amount of work required  |
|                                |                  |                     |         |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.