

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                            |                               |                                                                                                                                                                                                                                          |
|------------------------------------|--------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                            |                               |                                                                                                                                                                                                                                          |
| Module Title                       | <b>Digital Forensics</b>                   |                               | 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                        | <b>CSTE3106</b>                            |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                                          |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | <b>125</b>                                 |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 5                                          | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department           | CSTE                                       | College                       | EETC                                                                                                                                                                                                                                     |
| Module Leader                      | Mahmoud Shuker Mahmoud                     | e-mail                        | <a href="mailto:mahmoud.shukur@mtu.edu.iq">mahmoud.shukur@mtu.edu.iq</a>                                                                                                                                                                 |
| Module Leader's Acad. Title        | Lecturer                                   | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |
| Module Tutor                       | Name (if available)                        | e-mail                        | E-mail                                                                                                                                                                                                                                   |
| Peer Reviewer Name                 | Assist. Prf. Dr. Dalal Abdulmohsin Hammood | e-mail                        | Dalal.hammood@mtu.edu.iq                                                                                                                                                                                                                 |
| Scientific Committee Approval Date | 06/11/2023                                 | 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. This course presents an overview of the principles and practices of digital investigation.</li> <li>2. emphasize the fundamentals and importance of digital forensics.</li> <li>3. learn different techniques and procedures that enable them to perform a digital investigation.</li> <li>4. analysis of physical storage media and volume analysis.</li> <li>5. It covers the major phases of digital investigation such as preservation, analysis and acquisition of artifacts that reside in hard disks and random-access memory</li> </ol>                                                                                                                                                                                                                                                                                                                                                           |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. Students will explain and properly document the process of digital forensics analysis.</li> <li>2. Students will gain an understanding of the tradeoffs and differences between various forensic tools.</li> <li>3. Students will be able to describe the representation and organization of data and metadata within modern computer systems.</li> <li>4. Students will understand the inner workings of file systems.</li> <li>5. Students will be able to create disk images, recover deleted files and extract hidden information.</li> <li>6. Students will be introduced to the current research in computer forensics. This will encourage them to define research problems and develop effective solutions</li> </ol>                                                                                                                                                                             |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p>Part A - [14 hrs]</p> <p>It covers the major phases of digital investigation such as preservation, analysis and acquisition of artifacts that reside in hard disks and random access memory</p> <p>Part B – [16 hrs]</p> <p>practical implementation in the business environment. During the course, you will gain insights to the general history of digital forensics, and acquire the requisite skills to conduct digital forensic investigations more effectively.</p> <p>Part C – [16 hrs]</p> <p>covers topics of digital forensic processes, hardware forensics, digital forensic tools, forensic readiness, networks forensics, live forensics, professionalism and ethics.</p> <p>Part D – [20 hrs]</p> <p>Describe further gain in-depth knowledge of privacy, cyber forensics, cyber law and cyber warfare and/or terrorism, among other aspects relevant to digital forensics.</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 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       | 79  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| <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, 13      | LO #1-3                   |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 6, 12      | LO # 4,5, 6               |
|                             | <b>Projects / Lab.</b> | 5           | 15% (15)         | Continuous | All                       |
|                             | <b>Report</b>          | 1           | 5% (5)           | 12         |                           |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 20% (20)         | 7          | LO # 1-3                  |
|                             | <b>Final Exam</b>      | 4 hr        | 50% (40 + 10)    | 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>                                                     | Overview of digital investigation and digital evidence                       |
| <b>Week 2</b>                                                     | Data Acquisition of physical storage devices                                 |
| <b>Week 3</b>                                                     | Study of file systems with a main focus on Microsoft Windows & Linux Systems |
| <b>Week 4</b>                                                     | File System Analysis & File Recovery                                         |
| <b>Week 5</b>                                                     | File carving & document analysis                                             |
| <b>Week 6</b>                                                     | Information hiding & steganography.<br>Time, registry & password recovery    |
| <b>Week 7</b>                                                     | Mid Term Exam + Review                                                       |
| <b>Week 8</b>                                                     | Email & database forensics                                                   |
| <b>Week 9</b>                                                     | Memory acquisition                                                           |
| <b>Week 10</b>                                                    | Networks forensics                                                           |
| <b>Week 11</b>                                                    | Professionalism and ethics in digital forensics                              |
| <b>Week 12</b>                                                    | Cyber forensics                                                              |
| <b>Week 13</b>                                                    | Cyber law                                                                    |
| <b>Week 14</b>                                                    | Cyber warfare and terrorism                                                  |
| <b>Week 15</b>                                                    | Applications of digital forensics                                            |
| <b>Week 16</b>                                                    | <b>A preparatory week before the Final Exam</b>                              |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                              |
|-------------------------------------------------------------------------|--------------------------------------------------------------|
|                                                                         | Material Covered                                             |
| <b>Week 1</b>                                                           | Lab 1: DIGITAL FORENSIC LABORATORY(DFL)<br>FUNCTIONS & ROLES |
| <b>Week 2</b>                                                           | Lab 2: COMPUTER FORENSICS                                    |
| <b>Week 3</b>                                                           | Lab 3: MOBILE DEVICE FORENSICS                               |
| <b>Week 4</b>                                                           | Lab 4: MALWARE ANALYSIS                                      |
| <b>Week 5</b>                                                           | Lab 5: COMPUTER INCIDENTS RESPONSE TEAM                      |
| <b>Week 6</b>                                                           | Lab 6: NETWORK FORENSICS                                     |
| <b>Week 7</b>                                                           | Lab 7: RESEARCH, TRAINING & DEVELOPMENT                      |
| <b>Week 8</b>                                                           | Lab 8: Forensic examination of computer and mobile phones    |

|                                 |                                                                                                         |                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------|
| Week 9                          | Lab 9: Maintenance of lab processes of acquisition, archival and analysis                               |                           |
| Learning and Teaching Resources |                                                                                                         |                           |
| مصادر التعلم والتدريس           |                                                                                                         |                           |
|                                 | Text                                                                                                    | Available in the Library? |
| Required Texts                  | Handbook of Digital Forensics and Investigation, by Eoghan Casey, Academic Press, ISBN 0123742676, 2009 |                           |
| Recommended Texts               | Handbook of Digital Forensics and Investigation, Edited by Eoghan Casey                                 |                           |
| Websites                        |                                                                                                         |                           |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b>                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| 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                       | <b>Multimedia Security</b> |                               | Module Delivery                                                                                                                                                                                                                                     |
| Module Type                        | Elective                   |                               | <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                        | <b>CSTE3206</b>            |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                                     |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | 3                          | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | CSTE                       | College                       | EETC                                                                                                                                                                                                                                                |
| Module Leader                      | Mahmoud Shuker Mahmoud     | e-mail                        | Mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                           |
| Module Leader's Acad. Title        | Lecturer                   | Module Leader's Qualification | PhD                                                                                                                                                                                                                                                 |
| Module Tutor                       | Name (if available)        | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Peer Reviewer Name                 | Dr. Mohamed Ibrahim Shujaa | e-mail                        | <a href="mailto:drshujaa@mtu.edu.iq">drshujaa@mtu.edu.iq</a>                                                                                                                                                                                        |
| Scientific Committee Approval Date | 06/11/2023                 | 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                      | This course will equip students with a deep understanding of multimedia security's theoretical and practical aspects. This course aims to prepare students to protect and secure multimedia content, which includes images, videos, and audio, in various applications and industries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>As a result of taking this course, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Learn the basic watermarking techniques to design a good digital mark.</li> <li>2. Study the digital authentication and authorization schemes to evaluate security issues related to electronic documents, images, and video.</li> <li>3. Analyze the basic characteristics of digital watermarking to perform the theoretical analysis and performance measures.</li> <li>4. Acquire the concepts of steganography to access the sensitive information concealing a file, message, image, or video within another file.</li> <li>5. Obtain a suitable least significant bits construction and dynamic embedding with one-dimensional cellular automata to resist differential attack and support parallel computing.</li> <li>6. Examine the multimedia encryption techniques to address the open issues related to confidentiality of the media content.</li> <li>7. Develop a multimedia system including multimedia compression techniques and standards, multimedia interfaces, video indexing, and retrieval techniques.</li> </ol> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following:</p> <p>Part 1 (Watermarking) [25 hr]<br/> Digital Watermarking Basics: Models of Watermarking, Basic Message Coding, Error Coding,<br/> Digital Watermarking Theoretic Aspects: Mutual information and Channel Capacity, Designing a Good Digital Mark, and Theoretical Analysis of Digital Watermarking. Watermarking Schemes include Spread Spectrum Watermarking, Transform Domain Watermarking, and Quantization Watermarking. Video Watermarking, Audio Watermarking, Binary Image Watermarking, Robustness to Temporal and Geometric Distortions, Affine resistant transformations.</p> <p>Part 2 (Steganography) [30 hr]<br/> Introduction- Digital Image formats- Modern Steganography, Steganography Channels<br/> Steganography Goals. Steganography Schemes include Image Steganography: Substitution, Bit Plane Coding, Transform Domain, Audio Steganography: Data Echo Hiding, Phase Coding, Video Steganography: Temporal technique, Spatial technique.</p>                                                                                                                                     |

|  |                                                                                                                                                                                 |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Part 3 (Multimedia Encryption & Techniques) [15 hr]<br>Introduction, Goals, Desired Characteristics, Performance metrics. Chaos-based, Block-based, Transform-based techniques. |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | Type something like: The main strategy that will be adopted in delivering this module is to encourage student's 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 interesting sampling activities for the students. |

| <b>Student Workload (SWL)</b><br><b>الحمل الدراسي للطالب</b>                   |     |                                                                            |   |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|---|
| <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 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 3 |
| <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, 2, 3, 7, 8 and 9   |
|                                                          | <b>Assignments</b>     | 2           | 10% (10)         | 2, 12      | LO # 4, 5, and 7          |
|                                                          | <b>Projects / Lab.</b> | 5           | 15% (15)         | Continuous |                           |
|                                                          | <b>Report</b>          | 1           | 5% (5)           | 13         | LO # 8, 9 and 10          |
| <b>Summative assessment</b>                              | <b>Midterm Exam</b>    | 2hr         | 10% (10)         | 7          | LO # 1-6                  |
|                                                          | <b>Final Exam</b>      | 4hr         | 50% (40 + 10)    | 16         | All                       |
| <b>Total assessment</b>                                  |                        |             | 100% (100 Marks) |            |                           |

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|                  | Material Covered                                                                                                |
|------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>    | Introduction to Digital Watermarking: Models of Watermarking, Basic Message Coding, Error Coding.               |
| <b>Week 2</b>    | Digital Watermarking Theoretic Aspects: Mutual information and Channel Capacity, Designing a good digital mark. |
| <b>Week 3</b>    | Spread Spectrum Watermarking,                                                                                   |
| <b>Week 4</b>    | Transform Domain Watermarking, Quantization Watermarking                                                        |
| <b>Week 5</b>    | Binary Image Watermarking                                                                                       |
| <b>Week 6</b>    | Video Watermarking                                                                                              |
| <b>Week 7</b>    | Audio Watermarking                                                                                              |
| <b>Week 8</b>    | <b>Mid Term Exam + Review</b>                                                                                   |
| <b>Week 9,10</b> | Introduction to Steganography: Introduction- Digital Image formats                                              |
| <b>Week 11</b>   | Image Steganography: Substitution, Bit Plane Coding, Transform Domain                                           |
| <b>Week 12</b>   | Video Steganography: Temporal technique, Spatial technique                                                      |
| <b>Week 13</b>   | Audio Steganography: Data Echo Hiding, Phase Coding                                                             |
| <b>Week 14</b>   | Multimedia Encryption: Introduction, Goals, Desired Characteristics, Performance metrics                        |
| <b>Week 15</b>   | Multimedia Techniques: Chaos-based, Block based, Transform based techniques                                     |

## Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered                                     |
|---------------|------------------------------------------------------|
| <b>Week 1</b> | Experiment 1: Image Watermarking Basics              |
| <b>Week 2</b> | Experiment 2: Transform Domain Watermarking          |
| <b>Week 3</b> | Experiment 3: Binary Image Watermarking              |
| <b>Week 4</b> | Experiment 4: Video Watermarking                     |
| <b>Week 5</b> | Experiment 5: Introduction to Image Steganography    |
| <b>Week 6</b> | Experiment 6: Image Steganography - Transform Domain |
| <b>Week 7</b> | Experiment 7: Video Steganography                    |
| <b>Week 8</b> | Experiment 8: Multimedia Encryption Techniques       |

| <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>                                                  | Shih, F. Y. (2017). Digital watermarking and steganography: fundamentals and techniques.                                 | No                               |
| <b>Recommended Texts</b>                                               | Cox, I., Miller, M., Bloom, J., Fridrich, J., Kalker, T. (2007). Digital watermarking and steganography. Morgan Kaufmann | 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. |                         |                     |           |                                       |

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## نموذج وصف المادة الدراسية

| Module Information                 |                                          |                      |                                                                                                                                                                                                                                                                |                                                                          |
|------------------------------------|------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                          |                      |                                                                                                                                                                                                                                                                |                                                                          |
| Module Title                       | <b>Artificial Intelligence</b>           |                      | Module Delivery                                                                                                                                                                                                                                                |                                                                          |
| Module Type                        | <b>Core</b>                              |                      | <input checked="" type="checkbox"/> Theory<br><input checked="" 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                        | <b>CSTE3202</b>                          |                      |                                                                                                                                                                                                                                                                |                                                                          |
| ECTS Credits                       | <b>5</b>                                 |                      |                                                                                                                                                                                                                                                                |                                                                          |
| SWL (hr/sem)                       | <b>125</b>                               |                      |                                                                                                                                                                                                                                                                |                                                                          |
| Module Level                       | <b>3</b>                                 | Semester of Delivery |                                                                                                                                                                                                                                                                | <b>6</b>                                                                 |
| Administering Department           | CSTE                                     | College              | EETC                                                                                                                                                                                                                                                           |                                                                          |
| Module Leader                      | Asst. Prof Dr. Dalal Abdulmohsin Hammood |                      | e-mail                                                                                                                                                                                                                                                         | Dalal.hammood@mtu.edu.iq                                                 |
| Module Leader's Acad. Title        | Assit. Prof. Dr.                         |                      | Module Leader's Qualification                                                                                                                                                                                                                                  | PhD                                                                      |
| Module Tutor                       | Name (if available)                      |                      | e-mail                                                                                                                                                                                                                                                         | E-mail                                                                   |
| Peer Reviewer Name                 | Mahmoud Shuker<br>Mahmoud                |                      | e-mail                                                                                                                                                                                                                                                         | <a href="mailto:mahmoud.shukur@mtu.edu.iq">mahmoud.shukur@mtu.edu.iq</a> |
| Scientific Committee Approval Date | 06/11/2023                               |                      | Version Number                                                                                                                                                                                                                                                 | 1.0                                                                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               |      | 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>                                                                               | <p>This course aims to provide the basic information of Artificial Intelligence (AI). Today, artificial intelligence has conquered almost every industry. Machine learning, intense learning.</p> <p>This Module will help the student to build a solid knowledge of the basics of AI, such as ANN, Genetic Algorithm</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | <p>As a result of taking this course, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Know and understand Artificial Intelligence (AI).</li> <li>2. Understand and know the basics of deep learning techniques.</li> <li>3. Understanding artificial neural networks.</li> <li>4. Train a neural network using the training data.</li> <li>5. Understand neural networks and their applications.</li> <li>6. Understand TensorFlow and tensor processing units.</li> <li>7. Understand Supervised and unsupervised learning methods.</li> <li>8. Understanding Genetic Algorithms and what are operators in G.A</li> <li>9. Implementing Genetic Algorithm in Examples</li> <li>10. Know Machine learning using Python.</li> <li>11. Understand how to make deep learning applications in image recognition, NLP, etc.</li> <li>12. Have an idea of Real-world projects in recommended systems, etc.</li> </ol> |
| <b>Indicative Contents</b><br><b>المحتويات الإرشادية</b>                                                                         | <p><u>Part A</u> – Indicative content includes the following.</p> <p>Introduction, artificial neural networks, neural network using the training data, applications of neural networks, logic gates in ANN<br/> Supervised and unsupervised learning methods<br/> Hebb and Madaline algorithms in ANN<br/> [10 hrs] + Revision problem classes in weekly tutorials [3 hrs]</p> <p><u>Part B</u> – Selected Algorithms:</p> <p>Madalines , delta rules algorithms in ANN, GA, operators, population, population size, selection, crossover, mutation, crossover rate, mutation rate.</p> <p>- [15 hrs] + Revision problem classes in weekly tutorials [4 hrs]</p> <p><u>Part C</u> –</p> <p>Examples of GA</p> <p>Examples M.L</p> <p>Examples D.L</p>                                                                                                                                                                                        |

|  |                                                                                    |
|--|------------------------------------------------------------------------------------|
|  | Project<br>. [17 hrs] + Revision problem classes in weekly tutorials<br>Is [8 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 student's participation in learning the basics of AI. This will be achieved through classes, discussions, assignment, interactive tutorials, online lecture, and by considering type of lab experiments involving assignments and programming activities related to the subject. |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب                             |     |                                                                            |   |
|-----------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب<br>خلال الفصل       | 79  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب<br>خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 3 |
| <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         | 3           | 15% (15)         | 5, 10, 14  | LO # (1 to 4), (6, 7), (8, 9) |
|                       | Assignments     | 1           | 5% (5)           | 6          | LO #5                         |
|                       | Projects / Lab. | 5           | 15% (15)         | Continuous |                               |
|                       | Report          | 1           | 5% (5)           | 15         | LO #10                        |
| Summative assessment  | Midterm Exam    | 2hr         | 10% (10)         | 7          | LO # 1- 5                     |
|                       | Final Exam      | 4 hr        | 50% (40 + 10)    | 16         | All                           |
| Total assessment      |                 |             | 100% (100 Marks) |            |                               |

| Delivery Plan (Weekly Syllabus) |                                                                     |
|---------------------------------|---------------------------------------------------------------------|
| المنهاج الأسبوعي النظري         |                                                                     |
|                                 | Material Covered                                                    |
| Week 1                          | AI: An Overview;                                                    |
| Week 2                          | ANN, activation function, logic gates such as ; AND , OR, XOR gates |
| Week 3                          | Hebb algorithm                                                      |
| Week 4                          | Adaline algorithm, Madalines algorithm                              |
| Week 5                          | Perceptron algorithm                                                |
| Week 6                          | Introduction to GA, types of operators, selection                   |
| Week 7                          | <b>Mid-Term Exam + Review</b>                                       |
| Week 8                          | crossover, crossover rate, mutation, mutation rate                  |
| Week 9                          | Example 1 : GA                                                      |
| Week 10                         | Examples 2: GA                                                      |
| Week 11                         | Advantages and disadvantages of GA                                  |
| Week 12, 13                     | Machine learning using Python.                                      |
| Week 14, 15                     | Applications of deep learning in image recognition, NLP, etc.       |
| Week 16                         | <b>A preparatory week before the Final Exam</b>                     |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المناهج الأسبوعي للمختبر |                                                                     |
|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|                                                                         | Material Covered                                                    |
| <b>Week 1</b>                                                           | Lab1: Python Programming Language and it's Use with AI: An Overview |
| <b>Week 2</b>                                                           | Lab 2: Logic gates NOT, AND, OR, XOR Gates                          |
| <b>Week 3</b>                                                           | Lab 3: Hebb algorithms, Adaline algorithm                           |
| <b>Week 4</b>                                                           | Lab 4: Madaline algorithm, delta rule algorithm                     |
| <b>Week 5</b>                                                           | Lab 5: perceptron algorithm                                         |
| <b>Week 6</b>                                                           | Lab 6: Genetic Algorithm: population size and selection             |
| <b>Week 7</b>                                                           | <b>Mid Exam + Review</b>                                            |
| <b>Week 8</b>                                                           | Lab 7: crossover and mutation                                       |
| <b>Week 9</b>                                                           | Lab 8: example of M.L in python                                     |
| <b>Week 10</b>                                                          | Lab 9: example 1 of GA                                              |
| <b>Week 11</b>                                                          | Lab 10: example 2 of GA                                             |
| <b>Week 12</b>                                                          | Lab 11: example of ANN                                              |
| <b>Week 13</b>                                                          | Students Project                                                    |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                                                                                                                                                          |                           |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                                                                                                                                                                                                                                                                                                                                     | Available in the Library? |
| <b>Required Texts</b>                                           | <ul style="list-style-type: none"> <li>Fundamental of neural networks ; Architectures, Algorithms , Applications. By Laurene Fausett</li> <li>Handbook of Genetic Algorithms by L.Davis</li> <li>Deep Learning with Python by François Chollet</li> <li>Learn AI with Python by Prateek Joshi</li> <li>Neural Networks and Deep Learning by Charu C. Aggarwal</li> </ul> | No                        |
| <b>Recommended Texts</b>                                        | <ul style="list-style-type: none"> <li>Fundamental of neural networks ; Architectures, Algorithms , Applications. By Laurene Fausett</li> <li>Handbook of Genetic Algorithms by L.Davis</li> <li>Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville</li> </ul>                                                                                          | 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                       | <b>Cybersecurity Essentials</b>             |                               | Module Delivery                                                                                                                                                                                                                                     |                                                                          |
| Module Type                        | Core                                        |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" 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                        | <b>CSTE3201</b>                             |                               |                                                                                                                                                                                                                                                     |                                                                          |
| ECTS Credits                       | 5                                           |                               |                                                                                                                                                                                                                                                     |                                                                          |
| SWL (hr/sem)                       | 125                                         |                               |                                                                                                                                                                                                                                                     |                                                                          |
| Module Level                       | 3                                           | Semester of Delivery          |                                                                                                                                                                                                                                                     | 6                                                                        |
| Administering Department           | CSTE                                        | College                       | EETC                                                                                                                                                                                                                                                |                                                                          |
| Module Leader                      | Mahmoud Shuker Mahmoud                      |                               | e-mail                                                                                                                                                                                                                                              | <a href="mailto:mahmoud.shukur@mtu.edu.iq">mahmoud.shukur@mtu.edu.iq</a> |
| Module Leader's Acad. Title        | Lecturer                                    | Module Leader's Qualification | PhD                                                                                                                                                                                                                                                 |                                                                          |
| Module Tutor                       |                                             |                               | e-mail                                                                                                                                                                                                                                              |                                                                          |
| Peer Reviewer Name                 | Assist. Prof. dr. Dalal Abdulmohsin Hammood |                               | e-mail                                                                                                                                                                                                                                              | Dalal.hammood@mtu.edu.iq                                                 |
| Scientific Committee Approval Date | 06/112023                                   | 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>Upon completion of this course, you will have acquired the following knowledge:</p> <ol style="list-style-type: none"> <li>1. This material discussed the threat and threat sources. It has covered different types of threat actors/agents in detail.</li> <li>2. Discussed the importance of threat vectors.</li> <li>3. Discussed malware and the common techniques attackers use to distribute malware on the web. This module has discussed different types of malware.</li> <li>4. Discussed network security vulnerabilities, including various examples. It covered the common areas of vulnerability.</li> <li>5. Discussed the impact of vulnerabilities and the risks posed by vulnerabilities.</li> <li>6. This lecture discussed the motives, goals, and objectives of information security attacks. It also covered the classification of attacks. Furthermore, it discussed hacking methodologies and frameworks.</li> <li>7. Discussed network-level, application-level, and OS-level attacks. It further discussed wireless network-specific attacks.</li> <li>8. discussed the fundamentals of information security It has covered the NIST cybersecurity framework.</li> <li>9. discussed the principles of information assurance (IA) It also discussed the different types of network defense approaches discussed various regulatory frameworks, laws, and acts.</li> <li>10. discussed the importance of physical security and its role in the organization's information security program.</li> <li>11. Introduce you to the various physical security controls and security measures that organizations should consider while implementing physical security.</li> </ol> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Understand the threat and threat sources, Describe the threat actors/agents, and describe the threat vectors.</li> <li>2. Understand the malware and the common techniques attackers use to distribute malware on the web and explain the different types of malware.</li> <li>3. Explain the vulnerability and examples of network security vulnerabilities; understand the common areas of vulnerability.</li> <li>4. Describe the impact of vulnerabilities, understand the risk of vulnerabilities, and understand the classification of vulnerabilities.</li> <li>5. Explain the motives, goals, and objectives of information security attacks, Understand the classification of attacks.</li> <li>6. Understand hacking methodologies and frameworks. Describe network-level, application-level, and OS-level attacks.</li> <li>7. Understand the fundamentals of information security, Understand the National Institute of Standards and Technology (NIST) cybersecurity framework.</li> <li>8. Understand the fundamentals of network security, Describe the principles of</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p>information assurance (IA), Understand the different types of network defense approaches, Explain the elements of network defense.</p> <p>9. Understand the terminology, principles, and types of access control, Describe identity and access management (IAM)</p> <p>10. Understand user access management, Explain the different types of authentication.</p> <p>11. Explain the different types of authorization, Understand user accounting, Understand various regulatory frameworks, laws, and acts, Understand why organizations need compliance, Understand how to define, implement, manage, and maintain an information security governance program; Explain information security drivers</p> <p>12. Understand how to manage an enterprise information security compliance program, Understand the different types of security policies, Understand the different types of security and awareness training.</p> <p>13. Understand the importance of physical security, Understand the physical security attack vectors, Describe the various types of physical security controls, Explain the importance of workplace security</p>                                                                                                                                                                                                                                    |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><u>information Security Threats Overview</u></p> <p>Definition and function of the threat sources, threat actors, and threat vectors to information security. It provides insight into the various attributes of threat actors. Later, the module discusses malware and common techniques attackers use to distribute malware on the web. It provides a brief discussion on different types of malware. [15 hrs]</p> <p><u>Vulnerabilities</u></p> <p>Gives an introduction to vulnerabilities and their impact. It provides insight into the common areas of vulnerability. The module ends with a brief discussion on vulnerability classification. [10 hrs]</p> <p><u>Information Security Attacks</u></p> <p>Overview of information-security attacks. It provides insight into hacking methodologies and frameworks. Later, the module discusses various types of network-level, application-level, and wireless-network-specific attacks. The module ends with a brief discussion on the Internet of Things (IoT), operational technology (OT), cloud, and cryptographic attacks. [10 hrs]</p> <p><u>Network Security Fundamentals</u></p> <p>Definition and overview of the fundamentals of information security. It provides into information assurance (IA) principles. Discusses various types of network defense</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>approaches. a brief discussion on network security controls and network defense elements. [15 hrs]</p> <p><u>Identification, Authentication, and Authorization</u></p> <p>This lecture provides an overview of various methods and techniques used for the identification, authentication, and authorization of users accessing critical assets and resources. [10 hrs]</p> <p><u>Administrative Controls and Physical Controls</u></p> <p>The addresses this administrative aspect of an organization's network security and explains the importance of physical security, various physical security controls, importance of workplace security, and various environmental controls. [10 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 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                          |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <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 أسبوعيا       | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| <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, 11      | LO #,3,4, 9 and 10        |
|                       | Assignments     | 2           | 10% (10)         | 3, 9       | LO # 1, 2, 6, 7 and 8     |
|                       | Projects / Lab. | 5           | 15% (15)         | Continuous |                           |
|                       | Report          | 1           | 5% (5)           | 13         | LO # 9, 10, 11 and 12     |
| Summative assessment  | Midterm Exam    | 2 hr        | 10% (10)         | 9          | LO # 1-8                  |
|                       | Final Exam      | 4 hr        | 50% (40 + 10)    | 16         | All                       |
| Total assessment      |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                                                                                                                                                                                                            |
|                                 | Material Covered                                                                                                                                                                                                                                                                                                                           |
| Week 1                          | <b>Fundamentals of Cyber Security:</b> Cyber Security Goals (CIA triad), principles, and standards.                                                                                                                                                                                                                                        |
| Week 2                          | <b>Threats and threat Actors:</b> Threat Actors/Agents, Attributes of Threat Actors, Threat Vectors.                                                                                                                                                                                                                                       |
| Week 3                          | <b>Malware:</b> Introduction to Malware, its types, Malware infection, components of Malware, and types of Malware.<br><b>Trojans:</b> What is a Trojan, Indications of Trojan Attack, How Hackers Use Trojans, Common Ports used by Trojans, Types of Trojans)                                                                            |
| Week 4                          | <b>Viruses:</b> What is a Virus, Purpose of Creating Viruses, Indications of Virus Attack, Stages of Virus Lifecycle, Types of Viruses.<br><b>Computer Worms:</b> How is a Worm Different from a Virus, Rootkits, Potentially Unwanted Applications or Applications (PUAs), Spyware, Keylogger, Botnets, Fileless Malware.                 |
| Week 5                          | <b>Vulnerabilities:</b> What is Vulnerability, Examples of Network Security Vulnerabilities, Common Areas of Vulnerability, Impact Caused Due to Vulnerabilities, Risk, Understand Different Types of Vulnerabilities (Vulnerability Classification, Application Flaws, Poor Patch Management, Operating System Flaws, Third-party Risks). |
| Week 6                          | <b>Information Security Attacks:</b> Describe Hacking Methodologies and Frameworks                                                                                                                                                                                                                                                         |
| Week 7                          | <b>Network-level Attacks:</b> Application-level and OS-level Attacks                                                                                                                                                                                                                                                                       |
| Week 8                          | Social Engineering Attacks, Wireless Network-specific Attacks, IoT and Cloud Attacks                                                                                                                                                                                                                                                       |
| Week 9                          | <b>Mid-term Exam + Review</b>                                                                                                                                                                                                                                                                                                              |

|                |                                                                                                                                                                                                                                                                                |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 10</b> | Network Security Fundamentals (Essentials of Network Security, Goal of Network Defense, Information Assurance (IA) Principles, Network Defense Benefits, Network Defense Challenges, Types of Network Defense Approaches, Network Security Controls, Network Defense Elements) |
| <b>Week 11</b> | Access Control Principles, Terminologies, and Models (Access Control Principles, Logical Implementation of DAC, MAC, and RBAC)                                                                                                                                                 |
| <b>Week 12</b> | Identity and Access Management (IAM), User Access Management (AM): User Authentication, Types of Authentications (Password Authentication, Two-factor Authentication, Biometric Authentication, Smart Card Authentication, Single Sign-on (SSO) Authentication)                |
| <b>Week 13</b> | User Access Management (AM), Administrative Controls                                                                                                                                                                                                                           |
| <b>Week 14</b> | Physical Controls (Understand the Importance of Physical Security, Various Physical Security Controls)                                                                                                                                                                         |
| <b>Week 15</b> | A comprehensive review                                                                                                                                                                                                                                                         |
| <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>  | Create a Trojan to Gain Access to the Target System, Create a virus to Infect the Target System                   |
| <b>Week 2</b>  | Create a Worm using the Internet Worm Maker Thing, User System Monitoring and Surveillance using Spytech SpyAgent |
| <b>Week 3</b>  | Find Vulnerabilities on Exploit Sites                                                                             |
| <b>Week 4</b>  | Perform a Man-in-the-Middle (MITM) Attack using Cain & Abel                                                       |
| <b>Week 5</b>  | Perform MAC Flooding using macof,                                                                                 |
| <b>Week 6</b>  | Perform a DoS Attack on a Target Host using hping3                                                                |
| <b>Week 7</b>  | Perform an SQL Injection Attack Against MSSQL to Extract Databases using sqlmap                                   |
| <b>Week 8</b>  | Implement Access Controls in Windows Machine                                                                      |
| <b>Week 9</b>  | Manage Access Controls in Linux Machine                                                                           |
| <b>Week 10</b> | Implement Role-Based Access Control in Windows Admin Center (WAC)                                                 |
| <b>Week 11</b> | Implement a Centralized Authentication Mechanism                                                                  |
| <b>Week 12</b> | Implement Password Policies using Windows Group Policy                                                            |
| <b>Week 13</b> | Implement Auditing Policies                                                                                       |

| Learning and Teaching Resources |                                                                                                                                                       |                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                       |                           |
|                                 | Text                                                                                                                                                  | Available in the Library? |
| Required Texts                  | Cybersecurity Essentials 1st Edition<br>by Charles J. Brooks (Author), Christopher Grow (Author), Philip A. Craig Jr. (Author), Donald Short (Author) | No                        |
| Recommended Texts               | CYBER SECURITY: The Essential Guide (Hardcover, Sahil B. Gaikwad, Dr. Kabir G. Kharade, Prof. Dr Rashmi Agrawal, Prof. (Dr.) Rajanish K. Kamat)       | 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                       | <b>Web Design</b>          |                               | 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                        | <b>CSTE3204</b>            |                               |                                                                                                                                                                                                                                          |                           |
| ECTS Credits                       | 5                          |                               |                                                                                                                                                                                                                                          |                           |
| SWL (hr/sem)                       | 125                        |                               |                                                                                                                                                                                                                                          |                           |
| Module Level                       | 3                          | Semester of Delivery          |                                                                                                                                                                                                                                          | 6                         |
| Administering Department           | CSTE                       | College                       | EETC                                                                                                                                                                                                                                     |                           |
| Module Leader                      | Osama Abbas Hussein        |                               | e-mail                                                                                                                                                                                                                                   | Osama.abbas@mtu.edu.iq    |
| Module Leader's Acad. Title        | Lecturer                   | Module Leader's Qualification | PhD                                                                                                                                                                                                                                      |                           |
| Module Tutor                       | Ali Nafaa Gaafar           |                               | e-mail                                                                                                                                                                                                                                   | ali_nafaa@mtu.edu.iq      |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud |                               | e-mail                                                                                                                                                                                                                                   | mahmoud.shukur@mtu.edu.iq |
| Scientific Committee Approval Date | 06/11/2023                 | 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. Enable the student to <b>understand the principles of effective web design:</b></li> <li>2. <b>To develop proficiency in HTML, CSS, and Basic JavaScript.</b></li> <li>3. <b>Have the student capable of Implementing Responsive web design.</b></li> <li>4. <b>To apply UX/UI Design concepts</b> correctly.</li> <li>5. <b>To create web-designs that is integrated with backend languages.</b></li> <li>6. <b>Getting familiar with the already existing CMS solutions which dominate the market in terms of market share and public adaptation.</b></li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. <b>Demonstrate proficiency in using HTML and CSS</b> to create well-structured, styled, and responsive web pages.</li> <li>2. <b>Apply fundamental principles of design</b> including color theory, typography, and layout in web contexts, ensuring aesthetically pleasing designs that adhere to industry standards.</li> <li>3. <b>Utilize JavaScript for basic interactivity</b>, understanding how client-side scripting can enhance user experience by manipulating webpage elements and handling events.</li> <li>4. <b>Implement responsive web design practices</b>, ensuring websites function across different devices and screen sizes using fluid grid layouts, flexible images, and media queries.</li> <li>5. <b>Adhere to UX/UI principles</b> to plan and design intuitive, user-friendly websites, incorporating user research and feedback in the design process.</li> <li>6. <b>Develop a website project from concept to launch</b>, demonstrating the ability to plan, design, create, and maintain a website, incorporating multimedia content effectively.</li> <li>7. <b>Understand and apply SEO best practices</b> to web design to optimize websites for search engines, increasing visibility and ranking.</li> <li>8. <b>Ensure web accessibility</b>, creating websites that are usable by people with a wide range of abilities and disabilities, following the Web Content Accessibility Guidelines (WCAG).</li> <li>9. <b>Critically evaluate website quality</b>, using established criteria to review, test, and provide constructive feedback on the usability and effectiveness of a site's design.</li> <li>10. <b>Integrate web-designs with backend languages to provide fully functioning websites and user-oriented services.</b></li> <li>11. <b>Understand basic web security principles</b>, protecting user data and ensuring the security of websites from common vulnerabilities.</li> </ol> |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p><b>12. Compile a professional portfolio</b>, showcasing a range of completed web projects, reflecting personal creativity, technical skills, and a journey of learning throughout the course.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p>Part-A [15 Hrs]</p> <p>Introduce the student to the concept of web design and its components, HTML, CSS and its advanced concepts.</p> <p>Part-B [15 Hrs]</p> <p>Gets involved responsive design, UI, UX principles and have an overview about the whole web-site design process.</p> <p>Part-C [15 Hrs]</p> <p>Moving to more advanced concepts in JS.</p> <p>Part-D [15 hrs]</p> <p>Integrating the web-designs with backend technologies to have fully functioning websites with both admin-panels and public-facing components.</p> <p>Part-E [10 hrs]</p> <p>Getting involved in Search engine optimization and web-accessibility concepts and best practices.</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> |

| Student Workload (SWL)<br>الحمل الدراسي للطالب                                 |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <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 أسبوعيا       | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| <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)         | 6, 10      | LO #3,4 and LO #7, 8      |
|                                            | Assignments     | 2           | 10% (10)         | 8, 13      | LO # 6, 9, 10, 11 and 12  |
|                                            | Projects / Lab. | 5           | 15% (15)         | Continuous |                           |
|                                            | Report          | 1           | 5% (5)           | 14         | LO # 10, 11, 12 and 13    |
| Summative assessment                       | Midterm Exam    | 2 hr        | 10% (10)         | 8          | LO # [1 to 6]             |
|                                            | Final Exam      | 4hr         | 50% (40 + 10)    | 16         | All                       |
| Total assessment                           |                 |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|                        | Material Covered                              |
|------------------------|-----------------------------------------------|
| <b>Week 1</b>          | Introduction to Web Design                    |
| <b>Week 2</b>          | HTML Basics                                   |
| <b>Week 3</b>          | CSS Fundamentals                              |
| <b>Week 4</b>          | Advanced HTML and CSS                         |
| <b>Week 5</b>          | Introduction to Responsive Design             |
| <b>Week 6</b>          | User Experience (UX) Principles               |
| <b>Week 7</b>          | User Interface (UI) Design                    |
| <b>Week 8</b>          | <b>Midterm Exam + Review</b>                  |
| <b>Week 9</b>          | Basics of JavaScript                          |
| <b>Week 10</b>         | Advanced JavaScript                           |
| <b>Week 11</b>         | SEO and Web Accessibility                     |
| <b>Week 12</b>         | Content Management Systems (CMS)              |
| <b>Week 13, 14, 15</b> | Backend Languages (PHP/NodeJS, )              |
| <b>Week 16</b>         | <b>Preparatory week before the final Exam</b> |

| Delivery Plan (Weekly Lab. Syllabus) |                                                                                                                             |                           |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------|
| المنهاج الاسبوعي للمختبر             |                                                                                                                             |                           |
|                                      | Material Covered                                                                                                            |                           |
| Week 1                               | Exploring Web Design                                                                                                        |                           |
| Week 2                               | Creating Webpages with HTML                                                                                                 |                           |
| Week 3                               | Styling with CSS                                                                                                            |                           |
| Week 4                               | Advanced HTML and CSS Practice                                                                                              |                           |
| Week 5                               | Making a Responsive Web Design                                                                                              |                           |
| Week 6                               | Delving into UX Design                                                                                                      |                           |
| Week 7                               | UI Enhancements                                                                                                             |                           |
| Week 8                               | Interactive Elements with JavaScript                                                                                        |                           |
| Week 9                               | Animations and Advanced Interactivity                                                                                       |                           |
| Week 10                              | SEO and Accessibility Optimization                                                                                          |                           |
| Week 11                              | CMS Exploration                                                                                                             |                           |
| Week 12                              | Advanced JavaScript                                                                                                         |                           |
| Week 13, 14, & 15                    | Admin-panel + public-facing website (store, blog, student-portal).                                                          |                           |
|                                      |                                                                                                                             |                           |
| Learning and Teaching Resources      |                                                                                                                             |                           |
| مصادر التعلم والتدريس                |                                                                                                                             |                           |
|                                      | Text                                                                                                                        | Available in the Library? |
| Required Texts                       | Book#1: Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics<br><br>Author: Jennifer Robbins. | NO                        |
|                                      | Book#2: Web Development and Design Foundations with HTML5<br><br>Author: Terry Felke-Morris.                                |                           |
| Supporting websites:                 | <a href="https://www.coursera.org/specializations/web-design">https://www.coursera.org/specializations/web-design</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                       | <b>Operating Systems</b>   |                      | Module Delivery                                                                                                                                                                                                                                     |                                                                          |
| Module Type                        | Core                       |                      | <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                        | <b>CSTE3203</b>            |                      |                                                                                                                                                                                                                                                     |                                                                          |
| ECTS Credits                       | 5                          |                      |                                                                                                                                                                                                                                                     |                                                                          |
| SWL (hr/sem)                       | 125                        |                      |                                                                                                                                                                                                                                                     |                                                                          |
| Module Level                       | 3                          | Semester of Delivery |                                                                                                                                                                                                                                                     | 6                                                                        |
| Administering Department           | CSTE                       | College              | EETC                                                                                                                                                                                                                                                |                                                                          |
| Module Leader                      | Dr. Loay Talib Al-Saffar   |                      | e-mail                                                                                                                                                                                                                                              | Loay.alsaffar@mtu.edu.iq                                                 |
| Module Leader's Acad. Title        | lecturer                   |                      | Module Leader's Qualification                                                                                                                                                                                                                       | PhD                                                                      |
| Module Tutor                       | Name (if available)        |                      | e-mail                                                                                                                                                                                                                                              | E-mail                                                                   |
| Peer Reviewer Name                 | Dr. Mahmoud Shuker Mahmoud |                      | e-mail                                                                                                                                                                                                                                              | <a href="mailto:mahmoud.shukur@mtu.edu.iq">mahmoud.shukur@mtu.edu.iq</a> |
| Scientific Committee Approval Date | 06/11/2023                 | 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 purpose of this course is to provide the basic information of operating systems as an intermediary between the user of a computer and the computer hardware. Describing the environment in which a user can execute programs in a convenient and efficient manner. Aiming students to understand Operating-System Structures, Processes, Threads, Process Synchronization, CPU Scheduling, Dealing with memory, storage, and I/O system, beside other Operating System related concepts.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>As a result of taking this course, the student should be able to:</p> <ol style="list-style-type: none"> <li>1. Know and understand What Operating Systems Do, Computer-System Organization, Computer-System Architecture.</li> <li>2. Know and understand Operating-System Structure, Operating-System Operations, Operating-System Services.</li> <li>3. Know and understand User and Operating-System Interface, System Calls, System Programs.</li> <li>4. Know and understand Process Management, Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication.</li> <li>5. Know and understand Threads, Multi-core Programming, Multi-threading Models.</li> <li>6. Know and understand CPU Scheduling, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling.</li> <li>7. Know and understand Process Synchronization, The Critical-Section Problem (Two-process solution, Multiple-Process solutions), Synchronization Hardware, and Semaphores.</li> <li>8. Know and understand the Classic Problems of Synchronization: The Bounded- Buffer Problem, The Readers - Writer Problem, The Dining-Philosophers Problem.</li> <li>9. Know and understand Deadlocks, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.</li> <li>10. Know and understand Storage Management; including Memory Management, Virtual Memory, File-System Interface, and File System Implementation.</li> <li>11. Know and understand I/O System (I/O hardware, Polling, Interrupt, Kernel I/O Subsystem; including I/O scheduling, Buffering, Caching , Spooling, and Error Handling).</li> </ol> |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p>Introduction to Operating system Concepts (Computer-System Organization, Architecture, Structure, Operations)</p> <p>Understanding Processes (Concept, Scheduling, Operations, Communication)</p> <p>Understanding Threads including Multi-core Programming and Multi-threading Models.</p> <p>Understanding CPU Scheduling, Process Synchronization, Deadlocks Handling, Storage Management, and all the related concepts and operations related to them.</p> <p>Understanding I/O System and it's related concepts to be managed by the Operating system.</p> |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Learning and Teaching Strategies                                           |                                                                                                                                                                                                                                                                                                                                                                                             |                                                                    |   |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---|
| استراتيجيات التعلم والتعليم                                                |                                                                                                                                                                                                                                                                                                                                                                                             |                                                                    |   |
| Strategies                                                                 | The main strategy that will be adopted in delivering this module is to encourage student’s participation in learning and developing their Knowledge in Operating System concepts. This will be achieved through classes, discussions, assignment, interactive tutorials and by considering type of lab experiments involving assignments and programming activities related to the subject. |                                                                    |   |
| Student Workload (SWL)                                                     |                                                                                                                                                                                                                                                                                                                                                                                             |                                                                    |   |
| الحمل الدراسي للطالب                                                       |                                                                                                                                                                                                                                                                                                                                                                                             |                                                                    |   |
| Structured SWL (h/sem)<br>الحمل الدراسي المنتظم للطالب<br>خلال الفصل       | 79                                                                                                                                                                                                                                                                                                                                                                                          | Structured SWL (h/w)<br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 5 |
| Unstructured SWL (h/sem)<br>الحمل الدراسي غير المنتظم للطالب<br>خلال الفصل | 46                                                                                                                                                                                                                                                                                                                                                                                          | Unstructured SWL (h/w)<br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| Total SWL (h/sem)<br>الحمل الدراسي الكلي للطالب خلال<br>الفصل              | 125                                                                                                                                                                                                                                                                                                                                                                                         |                                                                    |   |

| Module Evaluation     |                 |             |                  |            |                                |
|-----------------------|-----------------|-------------|------------------|------------|--------------------------------|
| تقييم المادة الدراسية |                 |             |                  |            |                                |
|                       |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome      |
| Formative assessment  | Quizzes         | 3           | 15% (15)         | 6, 10, 13  | LO # (1 to 5), (7, 8), (9, 10) |
|                       | Assignments     | 1           | 5% (5)           | 7          | LO #6                          |
|                       | Projects / Lab. | 5           | 15% (15)         | Continuous |                                |
|                       | Report          | 1           | 5% (5)           | 14         | LO #11                         |
| Summative assessment  | Midterm Exam    | 2hr         | 10% (10)         | 7          | LO # 1- 6                      |
|                       | Final Exam      | 4hr         | 50% (40 + 10)    | 16         | All                            |
| Total assessment      |                 |             | 100% (100 Marks) |            |                                |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الأسبوعي النظري         |                                                                                                                                                     |
|                                 | Material Covered                                                                                                                                    |
| Week 1                          | What Operating Systems Do: An Overview                                                                                                              |
| Week 2                          | Computer-System Organization, Computer-System Architecture.                                                                                         |
| Week 3                          | Operating-System Structure, Operations, Services, Interface with the user, System Calls, System Programs.                                           |
| Week 4                          | Process Management, Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication.                                      |
| Week 5                          | Threads, Multi-core Programming, Multi-threading Models.                                                                                            |
| Week 6                          | CPU Scheduling, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling.                                  |
| Week 7                          | Mid-Term Exam + Review                                                                                                                              |
| Week 8                          | Process Synchronization; The Critical-Section Problem (Two-process solution, Multiple-Process solutions), Synchronization Hardware, and Semaphores. |
| Week 9                          | Classic Problems of Synchronization: The Bounded- Buffer Problem, The Readers - Writer Problem, The Dining-Philosophers Problem. And Monitors.      |
| Week 10                         | Deadlocks, Methods for Handling Deadlocks, Deadlock Prevention. Deadlock Avoidance, Deadlock Detection, and Deadlock Recovery.                      |
| Week 11                         | Storage and Memory Management                                                                                                                       |
| Week 12                         | Virtual Memory, File-System Interface, and File System Implementation.                                                                              |
| Week 13                         | I/O System (I/O hardware, Polling, Interrupt)                                                                                                       |
| Week 14                         | Kernel I/O Subsystem; including I/O scheduling, Buffering, Caching, Spooling, and Error Handling.                                                   |
| Week 15                         | Open Discussion and Information retrieval before the Final Exam.                                                                                    |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

|                | Material Covered                                                                                                                   |
|----------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Lab1: Introduction to a Programming Language (any programming Language chosen by the instructor/prof. to be used with this Module) |
| <b>Week 2</b>  | Lab 2: Variables and Operators.                                                                                                    |
| <b>Week 3</b>  | Lab 3: Control Statements.                                                                                                         |
| <b>Week 4</b>  | Lab 4: Functions (Subprograms).                                                                                                    |
| <b>Week 5</b>  | Lab 5: Implementing Different Programming Exercises.                                                                               |
| <b>Week 6</b>  | Lab 6: Scheduling Algorithms: FCFS (First Come First Serve) in Operating System.                                                   |
| <b>Week 7</b>  | Lab 7: Scheduling Algorithms: SJF (Shortest Job First) in Operating System.                                                        |
| <b>Week 8</b>  | Lab 8: Round-Robin Scheduling Algorithm in Operating System.                                                                       |
| <b>Week 9</b>  | Lab 9: Deadlock Detection Algorithm in Operating System.                                                                           |
| <b>Week 10</b> | Lab 10: Readers-Writers Problem (Programming)                                                                                      |
| <b>Week 11</b> | Lab 11: The monitor solution to the Dining-Philosopher problem (Programming)                                                       |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                         | Available in the Library? |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Operating System Concepts, Sixth Edition (or above), by Abraham Silberschatz, Peter Bare Galvin, and Greg Gagne. John Wiley & Sons, Inc.                     | Yes                       |
| <b>Recommended Texts</b> | Operating Systems in Depth, by Thomas W. Doeppner, 2011 John Wiley & Sons, Inc.                                                                              | No                        |
| <b>Websites</b>          | <a href="https://www.easycodingzone.com/">https://www.easycodingzone.com/</a><br><a href="https://www.geeksforgeeks.org/">https://www.geeksforgeeks.org/</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                       | <b>Computer Networks Protocols</b> |                               | Module Delivery                                                                                                                                                                                                                                     |
| Module Type                        | Core                               |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" 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                        | <b>CSTE3205</b>                    |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 5                                  |                               |                                                                                                                                                                                                                                                     |
| SWL (hr/sem)                       | 125                                |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | 3                                  | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | CSTE                               | College                       | EETC                                                                                                                                                                                                                                                |
| Module Leader                      | Mohamed I.Shujaa                   | e-mail                        | drshujaa@mtu.edu.iq                                                                                                                                                                                                                                 |
| Module Leader's Acad. Title        | Assist. Professor                  | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                               |
| Module Tutor                       | Name (if available)                | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Peer Reviewer Name                 | Mahmoud Shuker                     | e-mail                        | Mahmoud.shukur@mtu.edu.iq                                                                                                                                                                                                                           |
| Scientific Committee Approval Date | 06/11/2023                         | 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

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ol style="list-style-type: none"> <li>1. Prepare network engineers who can prepare and design all types of networks.</li> <li>2. This course teaches modern and advanced curricula in the field of computer networks.</li> <li>3. Providing high-quality modern research that can be applied in the field of computer networks and the Internet.</li> <li>4. Provide appropriate solutions to the problems of design and installation of networks and choose the best protocols.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. 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.</li> <li>2. Summarize the OSI model with all functions and objectives.</li> <li>3. Discuss the protocols of each layer and its function and work.</li> <li>4. Describe the network algorithms in the entire OSI model.</li> <li>5. Describe the errors in networking communication.</li> <li>6. Identify the solution for routing and forwarding in the network.</li> <li>7. Discuss the explain the security of the network.</li> <li>8. Discuss the protocols that deal with routing and security.</li> <li>9. Explain the TCP/IP model and its relationship with the OSI model</li> <li>10. Analyze, discuss, and use Network test results in the design and evaluation topology processes.</li> </ol> |
| <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>                                                                                                                                                                      |

|  |                                                                                                                                                                                    |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Switching routing. Components and experimental switching and algorithms. [7 hrs]<br>The transport layer, functions protocols, protocols application, and flow experiment. [15 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 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. |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب

|                                                                                |     |                                                                            |   |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|---|
| <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 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 3 |
| <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, 2, 10 and 11       |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 2, 12      | LO # 3, 4, 6 and 7        |
|                             | <b>Projects / Lab.</b> | 5           | 15% (15)         | Continuous |                           |
|                             | <b>Report</b>          | 1           | 5% (5)           | 10         | LO# 1-6                   |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 7          | LO # 1-7                  |
|                             | <b>Final Exam</b>      | 4 hr        | 50% (40 + 10)    | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                                                                                                                                                      |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Protocol Hierarchies in OSI model: (Application layer, presentation layer, session layer, transport layer, network layer, datalink layer. Physical layer) basics. PDU |
| <b>Week 2</b>  | Physical Layer Protocols, Protocol Design Issues, Transmission, and Multiplexing<br>Protocol Functionality, Layering, and Framework (SP3)                             |
| <b>Week 3</b>  | Link layer: Services Provided by the Link Layer, Multiple Access Links and HDLC Protocols, Taking-turns protocols,                                                    |
| <b>Week 4</b>  | Link layer Error control and flow control algorithms<br>MAC Protocols (Ethernet, DSL, ISDN, FDDI) ; CSMA/CD                                                           |
| <b>Week 5</b>  | <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.         |
| <b>Week 6</b>  | <b>Network Layer Protocols</b> - OSPF routing, EIGRP routing Rip, BGP, ICMP, DHCP                                                                                     |
| <b>Week 7</b>  | <b>Mid Term Exam + Review</b>                                                                                                                                         |
| <b>Week 8</b>  | Network Protocols: RIP, BGP, ICMP, DHCP                                                                                                                               |
| <b>Week 9</b>  | <b>Network layer components</b> Routing Algorithms (LS, DV)                                                                                                           |
| <b>Week 10</b> | IP (Internet Protocol), IP Datagram Fragmentation<br>IPv4, IPv6, IPsec                                                                                                |
| <b>Week 11</b> | Transport Layer Protocols Design<br>Congestion Control, Flow Control- Services                                                                                        |
| <b>Week 12</b> | <b>Presentation Protocols:</b> Security Protocols (SSL, SSH)                                                                                                          |
| <b>Week 13</b> | Application Layer Protocols (Architecture, services)                                                                                                                  |
| <b>Week 14</b> | Protocols: WWW (HTTP, HTTPs, FTP, DHCP,)                                                                                                                              |
| <b>Week 15</b> | <b>TCP/ IP Model &amp; Protocols Stack</b><br>Electronic Mail Protocols (SMTP, POP)<br>DNS, Telnet protocols                                                          |
| <b>Week 16</b> | <b>A preparatory week before the Final Exam</b>                                                                                                                       |
|                |                                                                                                                                                                       |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|                | Material Covered                                                    |
|----------------|---------------------------------------------------------------------|
| <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 (OSPF)                              |
| <b>Week 7</b>  | Lab 7: DHCP                                                         |
| <b>Week 8</b>  | Lab 8: EtherChannel                                                 |
| <b>Week 9</b>  | Lab 9: IPv6                                                         |
| <b>Week 10</b> | Lab 10: HTTP, DNS Protocol                                          |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                            | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | " TCP/P Protocol Suite" 5th Edition Behrouz A. Forouzan                         | Yes                       |
| <b>Recommended Texts</b> | "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross | No                        |
| <b>Websites</b>          | Cisco Networking Academy                                                        |                           |

### 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                       | <b>Wireless Networks Security</b>           |                               | Module Delivery                                                                                                                                                                                                                                     |                                                                        |
| Module Type                        | Elective learning activity                  |                               | <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 checked="" type="checkbox"/> Seminar |                                                                        |
| Module Code                        | <b>CSTE3206</b>                             |                               |                                                                                                                                                                                                                                                     |                                                                        |
| ECTS Credits                       | <b>5</b>                                    |                               |                                                                                                                                                                                                                                                     |                                                                        |
| SWL (hr/sem)                       | <b>125</b>                                  |                               |                                                                                                                                                                                                                                                     |                                                                        |
| Module Level                       | 3                                           | Semester of Delivery          |                                                                                                                                                                                                                                                     | 6                                                                      |
| Administering Department           | CSTE                                        | College                       | EETC                                                                                                                                                                                                                                                |                                                                        |
| Module Leader                      | Siraj Qays Mahdi                            |                               | e-mail                                                                                                                                                                                                                                              | <a href="mailto:Siraj_qays@mtu.edu.iq">Siraj_qays@mtu.edu.iq</a>       |
| Module Leader's Acad. Title        |                                             | Module Leader's Qualification | M.Sc.                                                                                                                                                                                                                                               |                                                                        |
| Module Tutor                       | Name (if available)                         |                               | e-mail                                                                                                                                                                                                                                              | E-mail                                                                 |
| Peer Reviewer Name                 | Assist. Prof. dr. Dalal Abdulmohsin Hammood |                               | e-mail                                                                                                                                                                                                                                              | <a href="mailto:Dalal.hammood@mtu.edu.iq">Dalal.hammood@mtu.edu.iq</a> |
| Scientific Committee Approval Date | 06/11/2023                                  | 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. understand the main security goals and adversarial models of wireless and mobile networks;</li> <li>2. gain a broad knowledge regarding real-world security architectures of WLANs, GSM/UMTS, WSNs, etc.;</li> <li>3. be able to reason about wireless security protocols and protection techniques, discuss proposed solutions and their limitations;</li> <li>4. have an overview of the recent advances regarding lightweight authentication, key management for wireless networks, secure localization, and wireless device pairing.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. Students will gain an understanding of wireless networking, protocols, and standards and security issues.</li> <li>2. The course will provide knowledge of information security technology and methods for communication systems that provide services for mobile users by wireless access networks.</li> <li>3. Knowledge and understanding of security mechanisms and protocols in wireless communication networks.</li> <li>4. Knowledge about some of the models, design principles, mechanisms, and solutions used in wireless network security to obtain secrecy, integrity, authentication, privacy, crypto key distribution, and access control.</li> <li>5. The student will acquire practice and analytical skills in information security assessment of technology and methods for communication systems that provide services for mobile users by wireless access networks.</li> <li>6. Each student selects after interests and motivation, under supervision, a technical topic to study within wireless</li> </ol> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p>Part A - [14 hrs]<br/> The purpose of this course is to familiarize participants with threats, vulnerabilities, and security countermeasures of existing and upcoming wireless and mobile networks.</p> <p>Part B – [16 hrs]<br/> The covered security topics include a wide range of mainstream wireless technologies, such as, WLAN, IEEE 802.11i Services, IEEE 802.11i Phases of Operation, Discovery Phase, Authentication Phase</p> <p>Part C – [16 hrs]<br/> the course will explore security and privacy problems, IEEE 802.11 Architecture and Protocols, WEP, IEEE 802.11i, IEEE 802.11w, WLAN MAC Layer.</p> <p>Part D – [20 hrs]</p>                                                                                                                                                                                                                                                                                                                                                                       |

|                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                        | Security for 1G, 2G Wi-Fi Applications, GSM and GPRS Security for Applications, UMTS                                                                                                                                                                                                                                                                                                                                |
| <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 محسوب لـ ١٥ اسبوعا       |     |                                                                           |   |
| <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 أسبوعيا       | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| <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 #1-3, 5                       |
|                                                   | <b>Assignments</b>     | 2                  | 10% (10)              | 2, 12           | LO #6                            |
|                                                   | <b>Projects / Lab.</b> | 5                  | 15% (10)              | Continuous      | All                              |
|                                                   | <b>Report</b>          | 1                  | 5% (5)                | 13              | LO #4-5                          |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hr               | 10% (20)              | 7               | LO # 1-3                         |
|                                                   | <b>Final Exam</b>      | 4 hr               | 50% (40 + 10)         | 16              | All                              |
| <b>Total assessment</b>                           |                        |                    | 100% (100 Marks)      |                 |                                  |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                                                                                                                                                                                                  |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | <b>Introduction of Wireless Security</b><br>Wireless Network Threats<br>Wireless Security Measures                                                                                                                |
| <b>Week 2</b>  | <b>Mobile Device Security</b><br>Security Threats<br>Mobile Device Security Strategy                                                                                                                              |
| <b>Week 3</b>  | <b>IEEE 802.11 Wireless LAN Overview</b><br>The Wi-Fi Alliance<br>IEEE 802 Protocol Architecture<br>IEEE 802.11 Network Components and Architectural Model<br>IEEE 802.11 Services                                |
| <b>Week 4</b>  | <b>IEEE 802.11i Wireless LAN Security</b><br>IEEE 802.11i Services<br>IEEE 802.11i Phases of Operation<br>Discovery Phase<br>Authentication Phase                                                                 |
| <b>Week 5</b>  | <b>IEEE 802.11i Wireless LAN Security</b><br>Key Management Phase<br>Protected Data Transfer Phase<br>The IEEE 802.11i Pseudorandom Function                                                                      |
| <b>Week 6</b>  | <b>IEEE 802.11 Wireless LAN</b><br>IEEE 802.11 Architecture and Protocols, Control and Management Frames, Rogue Access Points, WEP, IEEE 802.11i, IEEE 802.11w, Selfish behavior at the WLAN MAC Layer.           |
| <b>Week 7</b>  | <b>Mid Term Exam + Review</b>                                                                                                                                                                                     |
| <b>Week 8</b>  | <b>Application Level Security in Wireless Networks</b><br>Application of WLANs<br>Wireless Threats<br>Some Vulnerabilities and Attack Methods over WLANs                                                          |
| <b>Week 9</b>  | <b>Application Level Security in Wireless Networks</b><br>Security for 1G Wi-Fi Applications<br>Security for 2G Wi-Fi Applications<br>Recent Security Schemes for Wi-Fi Applications                              |
| <b>Week 10</b> | <b>Application Level Security in Cellular Networks</b><br>Generations of Cellular Networks<br>Security Issues and Attacks in Cellular Networks<br>GSM Security for Applications<br>GPRS Security for Applications |
| <b>Week 11</b> | <b>Application Level Security in Cellular Networks</b><br>UMTS Security for Applications<br>3G Security for Applications<br>Some of Security and Authentication Solutions                                         |
| <b>Week 12</b> | <b>Application Level Security in MANETs</b><br>MANETs<br>Some Applications of MANETs<br>MANET Features<br>Security Challenges in MANETs                                                                           |
| <b>Week 13</b> | <b>Application Level Security in MANETs</b><br>Security Attacks on MANETs                                                                                                                                         |

|                |                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | External Threats for MANET Applications<br>Internal Threats for MANET Applications<br>Some of the Security Solutions                                     |
| <b>Week 14</b> | <b>Application Level Security in Ubiquitous Networks</b><br>Ubiquitous Computing<br>Need for Novel Security Schemes for UC<br>Security Challenges for UC |
| <b>Week 15</b> | <b>Application Level Security in Ubiquitous Networks</b><br>Security Attacks on UC Networks<br>Some of the Security Solutions for UC                     |
| <b>Week 16</b> | <b>A preparatory week before the Final Exam</b>                                                                                                          |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                                                                                     |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|                                                                         | Material Covered                                                                                                                    |
| <b>Week 1</b>                                                           | Lab 1: Setting up a basic wireless network and exploring security settings.                                                         |
| <b>Week 2</b>                                                           | Lab 2: Analyzing common wireless security threats and vulnerabilities using Wireshark                                               |
| <b>Week 3</b>                                                           | Lab 3: Implementing different wireless LAN standards and understanding their security implications.                                 |
| <b>Week 4</b>                                                           | Lab 4: Exploring real-world applications of WLANs, such as IoT devices, and securing them.                                          |
|                                                                         | Lab 5: SSID Cloaking and Issues                                                                                                     |
| <b>Week 5</b>                                                           | Lab 6: Detecting and mitigating wireless threats using intrusion detection and prevention systems.                                  |
| <b>Week 6</b>                                                           | Lab 7: Simulating and analyzing security issues and attacks in cellular networks within the Wireshark simulator.                    |
| <b>Week 7</b>                                                           | Lab 7: Configuring application-level security for Mobile Ad-Hoc Networks (MANETs) using Packet Tracer.                              |
| <b>Week 8</b>                                                           | Lab 8: Implementing security measures for devices in ubiquitous networks, including IoT devices, and assessing their effectiveness. |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                               |                           |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                                                                          | Available in the Library? |
| <b>Required Texts</b>                                           | Cryptography and Network Security “ <i>Principles and Practice</i> ”, Seventh Edition<br>By William Stallings |                           |
| <b>Recommended Texts</b>                                        | “Wireless and Mobile Network Security” by Pallapa Venkataram and B Sathish Babu.                              |                           |
| <b>Websites</b>                                                 | <a href="https://www.packettracernetwork.com/">https://www.packettracernetwork.com/</a>                       |                           |

| <div>Grading Scheme</div> <div>مخطط الدرجات</div>                                                                                                                                                                                                                                                                                                                                    |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| 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                       | <b>Mobile Security</b>       |                      | Module Delivery                                                                                                                                                                                                                                     |                                                                        |
| Module Type                        | Core learning activity       |                      | <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 checked="" type="checkbox"/> Seminar |                                                                        |
| Module Code                        | <b>CSTE4203</b>              |                      |                                                                                                                                                                                                                                                     |                                                                        |
| ECTS Credits                       | <b>5</b>                     |                      |                                                                                                                                                                                                                                                     |                                                                        |
| SWL (hr/sem)                       | <b>125</b>                   |                      |                                                                                                                                                                                                                                                     |                                                                        |
| Module Level                       | 4                            | Semester of Delivery |                                                                                                                                                                                                                                                     | 8                                                                      |
| Administering Department           | CSTE                         | College              | EETC                                                                                                                                                                                                                                                |                                                                        |
| Module Leader                      | Dalal Abdulmohsin Hammood    |                      | e-mail                                                                                                                                                                                                                                              | <a href="mailto:dalal.Hammood@mtu.edu.iq">dalal.Hammood@mtu.edu.iq</a> |
| Module Leader's Acad. Title        | Assistant Prof.              |                      | Module Leader's Qualification                                                                                                                                                                                                                       | Ph.D.                                                                  |
| Module Tutor                       | Name (if available)          |                      | e-mail                                                                                                                                                                                                                                              | E-mail                                                                 |
| Peer Reviewer Name                 | Ph.D. Mohamed Ibrahim Shujaa |                      | e-mail                                                                                                                                                                                                                                              | <a href="mailto:drshujaa@mtu.edu.iq">drshujaa@mtu.edu.iq</a>           |
| Scientific Committee Approval Date | 06/11/2023                   | 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. describe the concepts and principles of mobile security;</li> <li>2. understand the security architecture and threat model of mobile networks;</li> <li>3. explain the security models of popular mobile operating systems, applications, and services;</li> <li>4. analyze the threats to popular mobile operating systems, applications, and services; and</li> <li>5. develop practical skills to detect attacks, to assess the security risk of mobile applications and services, and to analyze mobile malware.</li> </ol>                                                                                                                                                                                                                                                                      |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | <ol style="list-style-type: none"> <li>1. understand the security architectures of cellular networks and WiFi networks along, and acquire practical skills to identify the major threats to mobile communication;</li> <li>2. analyze the security models of the Android and iOS systems, and their applications;</li> <li>3. analyze Android applications, evaluate the threats to them, and dissect malware;</li> <li>4. identify major security and privacy issues in popular mobile services and applications; and</li> <li>5. acquire critical thinking and analytical skills, and improve technical writing as well as presentation skills.</li> </ol>                                                                                                                                                                                   |
| <b>Indicative Contents</b><br><b>المحتويات الإرشادية</b>                                                                         | <p>Indicative content includes the following.</p> <p>Part A - Overview of Mobile Communication and its Security [14 hrs]<br/> Overview of Mobile Communication and its Security Mobile communication concepts, Security goals, types of attacks, threat models, and review of basic cryptography</p> <p>Part B – Cellular Networks Security [16 hrs]<br/> Access control and authentication in cellular networks, 3G/4G networks and their security architectures, attacks on 3G/4G networks, UMTS, GSM and LTE</p> <p>Part C – WiFi Network Security [16 hrs]<br/> Introduction to 802.11 protocols, WEP, WPA/WPA2, Wi-Fi network attacks and threat assessment</p> <p>Part D – Mobile Malware [20 hrs]<br/> Taxonomy of mobile malware, mobile malware detection, static analysis of mobile malware, dynamic analysis of mobile malware.</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 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       | 79  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| <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, 5                |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 2, 12      | LO #3                     |
|                             | <b>Projects / Lab.</b> | 5           | 15% (15)         | Continuous | All                       |
|                             | <b>Report</b>          | 1           | 5% (5)           | 13         | LO #4-5                   |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 7          | LO # 1-3                  |
|                             | <b>Final Exam</b>      | 4 hr        | 50% (40 + 10)    | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|                | Material Covered                                               |
|----------------|----------------------------------------------------------------|
| <b>Week 1</b>  | Introduction to Mobile Security                                |
| <b>Week 2</b>  | Building Blocks – Basic security and cryptographic techniques. |
| <b>Week 3</b>  | Security of GSM Networks                                       |
| <b>Week 4</b>  | Security of UMTS Network                                       |
| <b>Week 5</b>  | LTE Security                                                   |
| <b>Week 6</b>  | WiFi and Bluetooth Security                                    |
| <b>Week 7</b>  | Mid Term Exam                                                  |
| <b>Week 8</b>  | SIM/UICC Security                                              |
| <b>Week 9</b>  | Mobile Malware and App Security                                |
| <b>Week 10</b> | Android Security Model                                         |
| <b>Week 11</b> | IOS Security Model                                             |
| <b>Week 12</b> | Security Model of the Windows Phone                            |
| <b>Week 13</b> | SMS/MMS, Mobile Geolocation and Mobile Web Security.           |
| <b>Week 14</b> | Mobile VoIP Communications                                     |
| <b>Week 15</b> | Security of Mobile VoIP Communications                         |
| <b>Week 16</b> | <b>A preparatory week before the Final Exam</b>                |

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

|               | Material Covered                                                                                                                                                                                                   |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | Lab 1: Introduction to Mobile Security:<br>Students explore the security settings on various mobile operating systems (iOS, Android), learning about device encryption, lock methods, and basic security settings. |
| <b>Week 2</b> | Lab 2: Mobile Device Lockdown:<br>Practical exercise in enhancing security by configuring device settings, exploring biometrics, screen locks, encryption, and remote wipe capabilities.                           |
| <b>Week 3</b> | Lab 3: VPN and Secure Communications:<br>Set up and use VPNs on mobile devices, explore the use of secure communication apps, and understand the underlying principles of secure data transmission.                |
| <b>Week 4</b> | Lab 4: Wi-Fi and Network Security:<br>Analyze risks associated with public Wi-Fi networks, set up secure Wi-Fi, and use network monitoring tools to detect potential threats or intrusions.                        |
| <b>Week 5</b> | Lab 5: Secure Mobile Browsing:<br>Explore secure browsers, understand the risks associated with cookies, trackers, and explore the utilities of privacy-focused browsing tools.                                    |

|               |                                                                                                                                                                                                         |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 6</b> | Lab 6: Mobile App Permissions Audit:<br>Evaluate app permissions, identify over-permissive apps, and understand the privacy and security implications of granted permissions.                           |
| <b>Week 7</b> | Lab 7: Mobile Device Management (MDM):<br>Use an MDM solution to enforce security policies, manage device features, and understand the principles of managing devices in enterprise environments.       |
| <b>Week 8</b> | Lab 8: Reverse Engineering Basic Mobile Apps: Disassemble apps to understand how they work, identify potential security issues, and understand methods for protecting apps against reverse engineering. |

| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                                                                                          |                           |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                          | Text                                                                                                                                     | Available in the Library? |
| <b>Required Texts</b>                                    | <ul style="list-style-type: none"> <li>Mobile Application Security, Himanshu Dviwedi, Chris Clark and David Thiel, 1st Editio</li> </ul> |                           |
| <b>Recommended Texts</b>                                 | <ul style="list-style-type: none"> <li>Security of Mobile Communications, Nouredine Boudriga, 2009</li> </ul>                            |                           |
| <b>Websites</b>                                          |                                                                                                                                          |                           |

| 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                       | <b>Information Theory and coding</b> |                      | Module Delivery                                                                                                                                                                                                                                     |                                   |
| Module Type                        | Core                                 |                      | <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                        | <b>CSTE3207</b>                      |                      |                                                                                                                                                                                                                                                     |                                   |
| ECTS Credits                       | 5                                    |                      |                                                                                                                                                                                                                                                     |                                   |
| SWL (hr/sem)                       | 125                                  |                      |                                                                                                                                                                                                                                                     |                                   |
| Module Level                       | 4                                    | Semester of Delivery |                                                                                                                                                                                                                                                     | 7                                 |
| Administering Department           | CSTE                                 | College              | EETC                                                                                                                                                                                                                                                |                                   |
| Module Leader                      | Name: Mahmood Farhan Mosleh          |                      | e-mail                                                                                                                                                                                                                                              | E-mail: drmahmoodfarhan@gmail.com |
| Module Leader's Acad. Title        | Professor                            |                      | Module Leader's Qualification                                                                                                                                                                                                                       | Ph.D.                             |
| Module Tutor                       |                                      |                      | e-mail                                                                                                                                                                                                                                              |                                   |
| Peer Reviewer Name                 |                                      |                      | e-mail                                                                                                                                                                                                                                              |                                   |
| Scientific Committee Approval Date | 06/11/2023                           | 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>                      | <ol style="list-style-type: none"> <li>1. To develop problem solving skills and understanding of information theory through the application of techniques.</li> <li>2. To understand the information representation.</li> <li>3. This course deals with the basic concept of source coding.</li> <li>4. To represent the information depending on the probabilities of events.</li> <li>5. To compress the data by various types of compression.</li> <li>6. To detect and correct the errors using channel coding methods.</li> </ol>                                                                                                                                                                                                                                                                           |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Having the skill to calculate the probability of any event.</li> <li>2. Modeling the information transmission system.</li> <li>3. Defined the information of noisy channel and posterior probabilities.</li> <li>4. Representation of the information source based on Shannon.</li> <li>5. Measure the information using entropies.</li> <li>6. Represent various types of channel models.</li> <li>7. Measure the entropy for various distribution methods.</li> <li>8. The skill of modeling various types of channels as a matrix.</li> <li>9. Measure the capacity of various types of channels.</li> <li>10. Improve the data rate using various types of source code algorithms.</li> <li>11. Having a basic skill in error detection and corrections</li> </ol> |
| <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 of the 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

|                                                                                |     |                                                                            |   |
|--------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------|---|
| <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 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 46  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5 |
| <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> | Quizzes         | 2           | 10% (10)         | 4, 12      | LO #1-3, LO #4-9          |
|                             | Assignments     | 2           | 10% (10)         | 2, 12      | LO # 1-10                 |
|                             | Projects / Lab. | 5           | 15% (15)         | Continuous |                           |
|                             | Report          | 1           | 5% (5)           | 13         | LO # 1-10                 |
| <b>Summative assessment</b> | Midterm Exam    | 2 hr        | 10% (10)         | 10         | LO # 1-6                  |
|                             | Final Exam      | 4hr         | 50% (40 +10)     | 16         | All                       |
| <b>Total assessment</b>     |                 |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|         | Material Covered                                                                                                                                                 |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1  | Review of related probability and statistics related topics.                                                                                                     |
| Week 2  | Model of information transmission system. Common sense definition of information<br>Logarithmic measure of information. Self-information.                        |
| Week 3  | Shannon representation diagram of information source. Parameters of discrete channel.                                                                            |
| Week 4  | Average information (entropy) of a discrete and continuous source, maximum source entropy. Source efficiency                                                     |
| Week 5  | Transition probability matrix of channel, discrete noiseless and noisy channel models, uniform channel. Ternary symmetric channel.                               |
| Week 6  | Information transmission over symmetric channel, noiseless channel, binary symmetric channel, ternary symmetric channel.                                         |
| Week 7  | Memory and memory less information channels .Binary Erasure channel (BEC).                                                                                       |
| Week 8  | Capacity of discrete channel, channel capacity for noiseless channel. Channel efficiency and redundancy. Channel capacity for symmetric channels.                |
| Week 9  | Sampling of continuous source. Sampling Theorem. Nyquist theorem for transmission over band limited continuous channel. Shannon-Hartly channel capacity theorem. |
| Week 10 | Source encoding; fixed and variable length codes. Prefix property. Average length of source code. Source code efficiency and redundancy.                         |
| Week 11 | Fano coding, Shannon- Fano methods.                                                                                                                              |
| Week 12 | Huffman code, data compression                                                                                                                                   |
| Week 13 | Channel Coding in Digital Communication Systems. Forward Error Correction (FEC)                                                                                  |
| Week 14 | Block codes. Cyclic Redundancy Check (CRC)                                                                                                                       |
| Week 15 | Repetition Codes, Single Parity Check Codes                                                                                                                      |
| Week 16 | Preparatory week before the final Exam                                                                                                                           |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

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

| Learning and Teaching Resources |                                                                                                                                                                                               |                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                                               |                           |
|                                 | Text                                                                                                                                                                                          | Available in the Library? |
| Required Texts                  | Thomas M. Cover, Joy A. Thomas, Elements of Information Theory, John Wiley & Sons, Inc. 1991                                                                                                  | Yes                       |
| Recommended Texts               | Coding Theory: Algorithms, Architectures, and Applications, Andreu Neubauer, John Wiley & Sons, 2007                                                                                          | 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. |                  |                     |           |                                       |