

Level Three  
(UGIII)  
Semester Five

# Module Descriptor Form

## نموذج وصف المادة الدراسية

| Module Information          |                         |                               |                                                                                                                                                                                                                                          |
|-----------------------------|-------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية     |                         |                               |                                                                                                                                                                                                                                          |
| Module Title                | Artificial Intelligence |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                 | Core                    |                               | <input 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                 | CSC35119                |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                | 6                       |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                | 150                     |                               |                                                                                                                                                                                                                                          |
| Module Level                | 3                       | Semester of Delivery          |                                                                                                                                                                                                                                          |
| Administering Department    | CS                      | College                       |                                                                                                                                                                                                                                          |
| Module Leader               | Rawaa Dawoud Hassan     | e-mail                        | rawaa.hassan@sc.uobaghdad.edu.iq                                                                                                                                                                                                         |
| Module Leader's Acad. Title | Assistant Professor     | Module Leader's Qualification | PhD.                                                                                                                                                                                                                                     |
| Module Tutor                | Rafal Ali Sameer        | e-mail                        | rafal.a@sc.uobaghdad.edu.iq                                                                                                                                                                                                              |
| Module Tutor                | Ahmed Hashim            | e-mail                        | ahmedhashem@pgiafs.uobaghdad.edu.iq                                                                                                                                                                                                      |
| Peer Reviewer Name          | Fatin Sadeq             | e-mail                        | fatin.alkinani@sc.uobaghdad.edu.iq                                                                                                                                                                                                       |
| Review Committee Approval   | 6/8/2025                | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation With Other Modules       |                              |          |     |
|-----------------------------------|------------------------------|----------|-----|
| العلاقة مع المواد الدراسية الأخرى |                              |          |     |
| Prerequisite module               | CSC12006, CSC24115, CSC24116 | Semester | 2,4 |
| Co-requisites module              | None                         | Semester |     |

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <p><b>Module Aims</b><br/>أهداف المادة الدراسية</p>                      | <p>The aims of AI are:</p> <ol style="list-style-type: none"> <li>1. Read human behavior to develop intelligent machines. Simply put, the foundational goal of AI is to design a technology that enables computer systems to work intelligently independently.</li> <li>2. Developing efficient problem-solving algorithms that can make logical deductions and simulate human reasoning while solving complex problem.</li> <li>3. AI systems offer methods to deal with uncertain situations or handle the incomplete information conundrum by employing probability theory, such as a stock market prediction system.</li> <li>4. Learning is fundamental to AI solutions. Conceptually, learning implies the ability of computer algorithms to improve the knowledge of an AI program through observations and past experiences. Technically, AI programs process a collection of input-output pairs for a defined function and use the results to predict outcomes for new inputs.</li> <li>5. Intelligent agents must be able to set goals and achieve them. They need a way to envision the future - a representation of the state of the world and make predictions about how their actions will change it - and be able to make choices that maximize the utility of the options available.</li> <li>6. A sub-field of AI addresses creativity theoretically (philosophical, psychological perspective) and practically (the specific implementation of systems that produce novel and useful outputs). Some related areas of computational research include artificial intuition and artificial thinking.</li> </ol> |
| <p><b>Module Learning Outcomes</b><br/>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. To develop a solid understanding of fundamental concepts, theories, and techniques in artificial intelligence, including machine learning, natural language processing, computer vision, and knowledge representation.</li> <li>2. To apply AI algorithms and techniques to solve real-world problems by designing and implementing appropriate algorithms, analyzing their efficiency and effectiveness, and making informed decisions about algorithm selection.</li> <li>3. To acquire practical programming skills in AI-related languages (e.g., Python) to implement and evaluate AI models and systems.</li> <li>4. To understand the ethical implications of AI technologies, including issues related to privacy, bias, transparency, and fairness. Develop awareness of societal impacts and the responsible use of AI.</li> <li>5. With better monitoring and diagnostic capabilities, artificial intelligence can dramatically influence healthcare.</li> <li>6. Design and evaluate conversational interfaces for different users and contexts of use.</li> <li>7. Design AI frameworks and structures to integrate robotic process automation (RPA) in business process management systems (BPMS).</li> </ol>                                                                                                                                                                                                                                                                                                                                                          |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p>                | <p>Inductive content include the following:<br/>Robotic vehicles, Speech recognition, Autonomous planning and scheduling, Game playing, Spam fighting, Logistics planning, Robotics, Machine Translation, are some of examples about what can AI do today. A programmer must be able to analyze and predict their behavior structures and strategies for State Space Search where graph theory is the best tool for reasoning about the structure of objects and relations [10 hrs].<br/>Study the state space representation of tic-tac-toe, 8-puzzle, and the traveling</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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|  | <p>salesperson. Depth-first search, breadth-first, and Depth-first iterative deepening search strategies (or Graph Search Algorithms) are the first search algorithms [10 hrs].</p> <p>Study the Best-First Search Algorithm and Best-First Search Algorithm with cost (Algorithm A). Evaluate the performance of several different heuristics for solving games with multiple playing strategies (8-puzzle board and Tic-tac-toe board) [15 hrs].</p> <p>Heuristics are the main component of the algorithm i.e., the brain of the algorithm without it the algorithm is not intelligent. Heuristics give boundaries to the algorithm, as in which not to select and which to select. Heuristics give the general estimate of the distance to goal node helping the algorithm to choose the optimal node in the next step [15 hrs].</p> <p>The game nim used to examine Minimax procedure searches strategy. Straight minimax requires a two-pass analysis of the search space, the first to descend to the ply depth and there apply the heuristic and the second to propagate values back up the tree. Minimax pursues all branches in the space, including many that could be ignored or pruned by a more intelligent algorithm. Researchers in game playing developed a class of search techniques called alpha-beta pruning [10 hrs].</p> |
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## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>Here are some learning and teaching strategies that can be employed in an AI course:</p> <ol style="list-style-type: none"> <li>1. Lectures: Traditional lectures can be used to introduce foundational concepts, theories, and algorithms in AI. Lectures can incorporate visual aids, examples, and case studies to enhance understanding.</li> <li>2. Practical Coding Assignments: Assigning coding assignments that involve implementing AI algorithms and techniques allows students to gain hands-on experience. They can work with programming languages such as Python.</li> <li>3. Group Projects: Encouraging students to work in groups on AI projects promotes collaboration, problem-solving, and teamwork. Projects can involve tasks like developing a chatbot, building a recommendation system, or designing an image recognition system.</li> <li>4. Case Studies: Analyzing real-world case studies that demonstrate the application of AI techniques in various domains (e.g., healthcare, finance, or transportation) helps students understand practical challenges and ethical considerations.</li> <li>5. Guest Speakers: Inviting guest speakers from industry or academia who specialize in AI can provide insights into real-world applications, research advancements, and emerging trends. They can share their experiences and inspire students.</li> <li>6. AI Demos and Workshops: Organizing demonstrations and hands-on workshops with AI tools and technologies allows students to explore AI applications and experiment with cutting-edge tools such as natural language processing or computer vision.</li> <li>7. Interactive Discussions: Facilitating class discussions on AI-related topics, ethical considerations, and societal impacts encourages critical thinking and helps students develop their perspectives on AI-related</li> </ol> |
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|  | <p>issues.</p> <p>8. Online Resources and Tutorials: Curating a list of online resources, including tutorials, research papers, and educational websites, provides additional learning materials for students to deepen their understanding and explore AI topics of interest.</p> <p>9. Assessments and Examinations: Using a mix of assessments, such as quizzes, exams, coding assignments, and project presentations, allows students to demonstrate their understanding of AI concepts and their ability to apply them.</p> <p>10. Ethical Debates: Incorporating ethical debates and discussions into the curriculum helps students explore the ethical implications of AI technologies and develop a broader perspective on the responsible use of AI.</p> <p>These strategies aim to engage students actively, promote practical application and critical thinking, and provide a well-rounded educational experience in the field of AI. The specific strategies employed may vary based on the course objectives, level of study, and available resources.</p> |
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| <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 أسبوعياً       | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 71  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                            |   |

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

| <b>Delivery Plan (Weekly Syllabus)</b><br>المناهج الاسبوعي النظري |                                                                                                                  |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                          |
| <b>Week 1</b>                                                     | 1. Artificial Intelligence Definitions and Applications                                                          |
| <b>Week 2</b>                                                     | 2. Graph Theory                                                                                                  |
| <b>Week 3</b>                                                     | 3. The state space representation of problems<br>a) Example (1): TIC-TAC-TOE                                     |
| <b>Week 4</b>                                                     | b) Example (2): THE 8-PUZZLE<br>c) Example (3): TRAVELLING SALESMAN PROBLEM                                      |
| <b>Week 5</b>                                                     | 4. Strategies for State Space Search (or Graph Search Algorithms)                                                |
| <b>Week 6</b>                                                     | 5. Blind (systematic) search algorithms<br>a) Depth-First search                                                 |
| <b>Week 7</b>                                                     | b) Breadth-First search                                                                                          |
| <b>Week 8</b>                                                     | a) Iterative Deepening Depth-First Search                                                                        |
| <b>Week 9</b>                                                     | 6. Heuristic (non-systematic) search<br>b) Best-First search (without cost)                                      |
| <b>Week 10</b>                                                    | a) Best-First search with cost (A algorithm)                                                                     |
| <b>Week 11</b>                                                    | 7. Heuristics in Games<br>a) 8-Puzzle board                                                                      |
| <b>Week 12</b>                                                    | b. Tic-Tac-Toe board                                                                                             |
| <b>Week 13</b>                                                    | 8. Analysis of heuristics<br>a. Admissible heuristic<br>b. Consistent heuristic<br>c. Informedness in heuristics |
| <b>Week 14</b>                                                    | 9. The MiniMax Procedure on Exhaustively Searchable Graphs                                                       |
| <b>Week 15</b>                                                    | 10. The Alpha-Beta Pruning                                                                                       |
| <b>Week 16</b>                                                    | Preparatory week before the final exam                                                                           |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                         | <b>Material Covered</b>                                                                                                                                                                                                                                                                                      |
| <b>Week 1</b>                                                           | Lab 1:<br>1. Download and Installation<br>8. What is PROLOG?<br>9. Facts, Rules, and Queries<br>10. Logical operators<br>11. What is a predicate in PROLOG?<br>12. Objects and comments<br>13. Exercises                                                                                                     |
| <b>Week 2</b>                                                           | Lab 2:<br>1. Debugging<br>2. Non-Graphical Debugger<br>3. Graphical Debugger<br>4. Which tool is best?<br>5. The cut (!) statement.<br>6. Exercises                                                                                                                                                          |
| <b>Week 3</b>                                                           | Lab 3:<br>1. Arithmetic operations<br>2. Recursion & Backtracking<br>3. Graph representation<br>4. Exercises                                                                                                                                                                                                 |
| <b>Week 4</b>                                                           | Lab 4:<br>1. What is a list<br>2. Extracting Information<br>3. Recursion with Lists<br>4. Exercises                                                                                                                                                                                                          |
| <b>Week 5</b>                                                           | Lab 5:<br>1. Problems and brainstorming<br>2. Search with lists<br>3. Exercises                                                                                                                                                                                                                              |
| <b>Week 6</b>                                                           | Lab 6:<br>1. Built-in functions (bagof, findall and setof)<br>2. Negation in PROLOG<br>3. Comparison operators<br>4. Modal dialog: promoting for answer<br>5. Exercises.                                                                                                                                     |
| <b>Week 7</b>                                                           | Lab 7: Python<br>1. Introduction.<br>2. Python compiler installation<br>3. Python file execution<br>4. Pip installation<br>5. Python IDE (Spyder)<br>6. Math operators<br>7. Data types<br>8. Variables<br>9. Comments<br>10. Build-in functions (print(), input(), len(), str(), int(), and float())<br>11. |

|                |                                                                                                                                                     |
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| <b>Week 8</b>  | Lab 8:<br>1. Flow control.<br>2. Boolean evaluation.<br>3. Function.<br>4. Exception Handling.                                                      |
| <b>Week 9</b>  | Lab 9:<br>1. Lists<br>2. Dictionaries<br>3. Sets                                                                                                    |
| <b>Week 10</b> | Lab 10: Search Algorithms<br>1. Blind Search: Depth-first search algorithm (PROLOG)<br>2. Blind Search: Depth-first search algorithm (Python)       |
| <b>Week 11</b> | Lab 11: Search Algorithms<br>3. Blind Search: Breadth-first search algorithm (PROLOG)<br>4. Blind Search: Breadth -first search algorithm (Python)  |
| <b>Week 12</b> | Lab 12: Search Algorithms<br>1. Heuristic Search: Best-First Search algorithm (PROLOG)<br>2. Heuristic Search: Best-First Search algorithm (Python) |
| <b>Week 13</b> | Lab 13: Search Algorithms<br>1. Heuristic Search: A* algorithm (PROLOG)<br>2. Heuristic Search: A* algorithm (Python)).                             |
| <b>Week 14</b> | Lab 15: Games<br>1. Tic-tac-toe<br>2. 8-Puzzle                                                                                                      |
| <b>Week 15</b> | Lab 16: Games<br>3. Traveling salesman problem<br>4. Projects                                                                                       |
| <b>Week 16</b> | Preparatory Week before the Final Exam                                                                                                              |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                                                                                                        |                                  |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                 | <b>Text</b>                                                                                                                                                                                                                                                                                                            | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                           | [Luger] Luger, George F. (2009) Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 6th edition. Boston: Addison-Wesley Pearson Education.<br><br>[Russell and Norvig] Russell, Stuart J. and Norvig, Peter (2010) Artificial Intelligence: A Modern Approach, 3rd edition, Prentice Hall. | Yes                              |
| <b>Recommended Texts</b>                                        | [Poole and Mackworth] Poole, David and Mackworth, Alan (2017) Artificial Intelligence: Foundations of Computational Agents, 2nd edition, Cambridge University Press.                                                                                                                                                   | No                               |
| <b>Websites</b>                                                 |                                                                                                                                                                                                                                                                                                                        |                                  |



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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                   |                      |                                                                                                                                                                                                                                                     |                                 |
|------------------------------------|-------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| معلومات المادة الدراسية            |                   |                      |                                                                                                                                                                                                                                                     |                                 |
| Module Title                       | COMPUTER NETWORKS |                      | 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                        | CSC35120          |                      |                                                                                                                                                                                                                                                     |                                 |
| ECTS Credits                       | 6                 |                      |                                                                                                                                                                                                                                                     |                                 |
| SWL (hr/sem)                       | 150               |                      |                                                                                                                                                                                                                                                     |                                 |
| Module Level                       | 3                 | Semester of Delivery |                                                                                                                                                                                                                                                     | 5                               |
| Administering Department           | Type Dept. Code   | College              | Type College Code                                                                                                                                                                                                                                   |                                 |
| Module Leader                      | Adnan J. Jabir    |                      | e-mail                                                                                                                                                                                                                                              | Adnan.jabir@sc.uobaghdad.edu.iq |
| Module Leader's Acad. Title        | Asst. Professor   |                      | Module Leader's Qualification                                                                                                                                                                                                                       | Ph.D.                           |
| Module Tutor                       |                   |                      | e-mail                                                                                                                                                                                                                                              |                                 |
| Peer Reviewer Name                 |                   |                      | e-mail                                                                                                                                                                                                                                              |                                 |
| Scientific Committee Approval Date | 6/8/2025          | Version Number       | 1.0                                                                                                                                                                                                                                                 |                                 |

| Relation with other Modules       |                    |  |          |     |
|-----------------------------------|--------------------|--|----------|-----|
| العلاقة مع المواد الدراسية الأخرى |                    |  |          |     |
| Prerequisite module               | CSC11002, CSC23110 |  | Semester | 1,3 |
| Co-requisites module              | None               |  | Semester |     |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br>أهداف المادة الدراسية                | <p>The aim of this module is to help the students understand the main concepts of computer networks related to standards, techniques and protocols that govern computer communications. The course will cover the theoretical and practical implementation of connecting computers using suitable CISCO configuration and network devices in LAB. Also the students will recognize different computer networks devices and their specifications that are available in the market.</p>                                                                                                                                                                                                                                                                                                                                                              |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. Define computer networks and its uses and devices in real life.</li> <li>2. Recognize computer networks communication concepts and criteria. .</li> <li>3. Describe the basis and structure of an abstract layered protocol model.</li> <li>4. Apply reliable connection in computer networks.</li> <li>5. Digital transmission for computer networks and transmission media in communication.</li> <li>6. Design and configure computer networks.</li> <li>7. Virtual LANs using CISCO switch devices.</li> <li>8. IP Addressing for computers.</li> <li>9. Class Addressing.</li> <li>10. Classless Addressing.</li> <li>11. Subnetting.</li> <li>12. Subnetting for computer network design.</li> <li>13. Data link layer functions.</li> <li>14. Error detection for transmitted packets.</li> </ol> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>The main strategy that will be adopted in delivering this module are:</p> <ol style="list-style-type: none"> <li>1. Powerpoint presentation (Data show and Videos lectures).</li> <li>2. Explanation on the white board using different color markers.</li> <li>3. Discussions with the student during teaching and online hangout meetings.</li> <li>4. Interaction with students through daily problems and exercises through lectures.</li> <li>5. Use CISCO devices in LAB to design computer networks in addition to simulator software.</li> <li>6. Solve different problems with more exercises that develop critical thinking for students.</li> <li>7. Submit assignments that develop student learning.</li> <li>8. Prepare reports about modern technologies to keep up to date with market and industry.</li> </ol> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| 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 | 71  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                           |   |

| Module Evaluation           |                        |             |                     |                |                                                                             |
|-----------------------------|------------------------|-------------|---------------------|----------------|-----------------------------------------------------------------------------|
| تقييم المادة الدراسية       |                        |             |                     |                |                                                                             |
|                             |                        | Time/Number | Weight (Marks)      | Week Due       | Relevant Learning Outcome                                                   |
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)            | 5 and 10       | (1), (2), (3)<br>(5, 6, 8)                                                  |
|                             | <b>Assignments</b>     | 2           | 10% (10)            | 6 and 12       | (1), (2), (3), (4),<br>(5),(6)<br>(8), (9), (10), (11),<br>(12), (13), (14) |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)            | Continuou<br>s | (1)- (14)                                                                   |
|                             | <b>Report</b>          | 1           | 10% (10)            | 13             |                                                                             |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2hr         | 10% (10)            | 7              | (1)- (6)                                                                    |
|                             | <b>Final Exam</b>      | 3hr         | 50% (50)            | 16             | All                                                                         |
| <b>Total assessment</b>     |                        |             | 100%<br>(100 Marks) |                |                                                                             |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                                                                                |
|                                 | Material Covered                                                                                                                                                                                               |
| <b>Week 1</b>                   | Introduction to Data Communication and Computer Networks, Network device, Networks types, and Network topologies.                                                                                              |
| <b>Week 2</b>                   | Protocol layering<br>OSI Model and TCP/IP models.                                                                                                                                                              |
| <b>Week 3</b>                   | Physical layer: encoding, signaling, communication media types, cables types and categories, network devices for layer 1. Ethernet principles.                                                                 |
| <b>Week 4</b>                   | Data link layer: framing, media access control technologies CSMA/CD, CSMA/CD, Physical Addressing MAC, Ethernet at datalink layer, ARP, Layer 2 devices switches and bridges, collision and broadcast domains. |

|                |                                                                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 5</b>  | Network layer: purpose and functions, protocols, IPv4 format IPv4 addressing, IPv4 classes.                                                                                |
| <b>Week 6</b>  | Sub-netting: Classless addressing and CIDR Notation<br>VLSM: Variable length subnet mask                                                                                   |
| <b>Week 7</b>  | Mid-Term Exam                                                                                                                                                              |
| <b>Week 8</b>  | Transport layer: purpose and function, protocols, TCP and UDP, protocols format, port addressing, flow control, error control, congestion control, three way hand shaking. |
| <b>Week 9</b>  | Routing and Switching                                                                                                                                                      |
| <b>Week 10</b> | Static routing and default route                                                                                                                                           |
| <b>Week 11</b> | Distance vector routing protocols                                                                                                                                          |
| <b>Week 12</b> | Link-state routing protocols                                                                                                                                               |
| <b>Week 13</b> | IPv6 protocol, header format, features of IPv6                                                                                                                             |
| <b>Week 14</b> | IPv6 addressing, unicast, anycast and multicast                                                                                                                            |
| <b>Week 15</b> | Preparatory Week                                                                                                                                                           |
| <b>Week 16</b> | Final Exam                                                                                                                                                                 |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|                | <b>Material Covered</b>                                                                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction: Network components, Network devices (routers and switches), Physical network types (Ethernet and Wi-Fi), Ethernet cabling, Internetworking, protocol                                                        |
| <b>Week 2</b>  | IP address config.: Planning the IP addresses, subnet mask and gateway for Internetwork, differences between static and dynamic IP address configuration, DHCP server, ipconfig ipconfig/release ipconfig/ renew commands |
| <b>Week 3</b>  | IP connectivity: Check the IP connectivity between two hosts in the network, request/response, source/destination, ICMP, ping and tracert commands                                                                        |
| <b>Week 4</b>  | ARP: MAC address, differences between MAC and IP address, ARP table, arp -a arp -s arp -d commands                                                                                                                        |
| <b>Week 5</b>  | DNS: Domain name resolution, DNS lookup, DNS cache, nslookup ipconfig/displaydns ipconfig/flushdns commands                                                                                                               |
| <b>Week 6</b>  | TCP vs UDP: Differences and similarities between TCP and UDP, port number, TCP connection, netstat command                                                                                                                |
| <b>Week 7</b>  | WLAN: Band and channel, unlicensed frequencies (2.4 and 5 GHz), AP configuration, WLAN security                                                                                                                           |
| <b>Week 8</b>  | Device Management: Inband vs out-of-band management, Cisco IOS modes and features                                                                                                                                         |
| <b>Week 9</b>  | Router IP config.: Enabling and assigning IP addresses to the router interfaces Configure the router as DHCP server, DHCP pool configuration                                                                              |
| <b>Week 10</b> | Static routing: Routing fundamentals, routing table, AD vs metric, static routing, default routing                                                                                                                        |
| <b>Week 11</b> | Dynamic routing : Static vs dynamic routing, routing protocol, distance vector routing protocol, RIP configuration<br>Link-state routing protocol, neighbor table, LSDB, loopback interface, OSPF configuration           |
| <b>Week 12</b> | VLAN: Advantages of VLAN, VLAN membership, access vs trunk ports, 802.1Q encapsulation, VLAN configuration<br>Different routing methods for VLAN, Router-on-Stick configuration, ML switch                                |

|                |                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------------------------------------------|
|                | configuration                                                                                                              |
| <b>Week 13</b> | NAT: Public vs private IP addresses, advantages of NAT, NAT types, source vs destination NAT                               |
| <b>Week 14</b> | IPv6: Purposes of IPv6, IPv6 vs IPv4, different types of IPv6 addresses, IPv6 auto-configuration, basic IPv6 configuration |
| <b>Week 15</b> | Preparatory Week                                                                                                           |
| <b>Week 16</b> | Final Exam                                                                                                                 |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                   | Available in the Library? |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | 1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, 2013.<br>2. CCNA 200-301, Official Cert Guide, Volume 1, WENDELL ODOM, Cisco Press Inc., 2020 | Yes                       |
| <b>Recommended Texts</b> | Douglas E. Comer, Computer networks and Internets, 6th Edition, 2015                                                                                                   | No                        |
| <b>Websites</b>          |                                                                                                                                                                        |                           |

### Grading Scheme

مخطط الدرجات

| Group                           | Grade                   | التقدير             | Marks %  | Definition                            |
|---------------------------------|-------------------------|---------------------|----------|---------------------------------------|
| <b>Success Group (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 (0 - 49)</b>      | <b>FX – Fail</b>        | راسب (قيد المعالجة) | (45-49)  | More work required but credit awarded |
|                                 | <b>F – Fail</b>         | راسب                | (0-44)   | Considerable amount of work required  |
|                                 |                         |                     |          |                                       |

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

# MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

| Module Information                 |                   |                               |                                                                                                                                                                                                                                          |
|------------------------------------|-------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                   |                               |                                                                                                                                                                                                                                          |
| Module Title                       | Computer Security |                               | Module Delivery                                                                                                                                                                                                                          |
| Module Type                        | Core              |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| CSC36135                           | CSC35121          |                               |                                                                                                                                                                                                                                          |
| ECTS Credits                       | 5                 |                               |                                                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 125               |                               |                                                                                                                                                                                                                                          |
| Module Level                       | 3                 | Semester of Delivery          | 5                                                                                                                                                                                                                                        |
| Administering Department           | CS                | College                       | Science                                                                                                                                                                                                                                  |
| Module Leader                      | Sarab M. Hameed   | e-mail                        | <a href="mailto:sarab.m@sc.uobaghdad.edu.iq">sarab.m@sc.uobaghdad.edu.iq</a>                                                                                                                                                             |
| Module Leader's Acad. Title        | Professor         | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                    |
| Module Tutor                       |                   |                               |                                                                                                                                                                                                                                          |
| Peer Reviewer Name                 |                   | e-mail                        |                                                                                                                                                                                                                                          |
| Scientific Committee Approval Date | 6/8/2025          | Version Number                | 1.0                                                                                                                                                                                                                                      |

| Relation with other Modules       |          |          |   |
|-----------------------------------|----------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |          |          |   |
| Prerequisite module               | CSC11002 | Semester | 1 |
| Co-requisites module              | None     | Semester |   |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br>أهداف المادة الدراسية                                                                         | <p>Upon successful completion of this course, the student will:</p> <ol style="list-style-type: none"> <li>1. Be able to define key security concepts and principles.</li> <li>2. Understand various authentication methods, such as passwords, biometrics, and multi-factor authentication.</li> <li>3. Implement access control mechanisms to restrict unauthorized access.</li> <li>4. Understand why networked computers have their particular vulnerabilities and how to mitigate exposure.</li> <li>5. Understand firewalls and intrusion detection/prevention systems</li> <li>6. Understand secure network design principles.</li> <li>7. Be familiar with non-technical issues like privacy, ethics, and legal aspects of security.</li> </ol>                                                                                                                                                                                                                                                                         |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | <p>The expected learning outcomes of the course are as follows:</p> <ol style="list-style-type: none"> <li>1. Acquiring a comprehensive understanding of computer and network security.</li> <li>2. Learning how to implement effective security measures to prevent threats from compromising systems and networks.</li> <li>3. Applying various means of user authentication and their common use cases.</li> <li>4. Following best practices to avoid malicious software</li> <li>5. Applying firewall policies that restrict the flow of network traffic to protect a host or network.</li> <li>6. Gaining knowledge about how to protect programs and data, the laws related to computer crimes and the legal process involved in such cases, and the specific characteristics of digital objects.</li> </ol>                                                                                                                                                                                                              |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                                                                         | <p><b>Part A: (15 hrs)</b><br/> Part A of the course covers the fundamental concepts of security, including assets, threats, vulnerabilities, controls, confidentiality, integrity, availability, attackers, and attack types. It also covers network concepts, authentication mechanisms such as password, biometric, and multi-factor authentication, access control principles and policies, access control models, types of malicious software, and how to secure access using AAA.</p> <p><b>Part B: (15 hrs)</b><br/> Part B of the course focuses on firewalls, including the types of firewalls and different firewall strategies. It also covers the role of a detector, the differences between an IDS and an IPS, types of IPS, and modes of detecting malicious traffic. Additionally, the course discusses the types of attacks on Layer and the best security practices for protecting Layer. Network security protocols in practice and legal issues and ethics are also covered in this part of the course.</p> |



| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <ol style="list-style-type: none"> <li>1. Delivering lectures to introduce and explain essential concepts, principles, and theories related to data structures. This helps students build a strong foundation of knowledge.</li> <li>2. Encouraging group projects and activities among students. This promotes teamwork and enhances understanding.</li> <li>3. Regular evaluations and examinations help gauge students' understanding and progress. These can include quizzes, assignments, and exams that assess theoretical knowledge and practical application of data structures.</li> <li>4. Enabling interactive conversations on computer and network security and exploring the latest developments in this domain.</li> <li>5. Recommending textbooks, internet resources, and supplementary references might help students study more effectively.</li> </ol> |

| <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       | 33  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 92  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 6 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                           |   |

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

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                                                                                                                                                                                                                                            |
| <b>Week 1</b>                                                     | <b>Security concepts</b> <ul style="list-style-type: none"> <li>Assets, threats, vulnerabilities, controls, confidentiality, integrity, availability, attackers, and attack types.</li> </ul>                                                                                                                                                      |
| <b>Week 2</b>                                                     | <b>Network concepts</b>                                                                                                                                                                                                                                                                                                                            |
| <b>Week 3</b>                                                     | <b>Authentication</b> <ul style="list-style-type: none"> <li>Password</li> <li>biometric</li> <li>Multi-factor authentication</li> </ul>                                                                                                                                                                                                           |
| <b>Week 4</b>                                                     | <b>Access Control</b> <ul style="list-style-type: none"> <li>Access control principles</li> <li>Access control policies</li> <li>Access control models</li> </ul>                                                                                                                                                                                  |
| <b>Week 5</b>                                                     | <b>Malicious Software</b>                                                                                                                                                                                                                                                                                                                          |
| <b>Week 6</b>                                                     | <b>Securing Access Using AAA</b>                                                                                                                                                                                                                                                                                                                   |
| <b>Week 7</b>                                                     | Exam                                                                                                                                                                                                                                                                                                                                               |
| <b>Week 8</b>                                                     | <b>Firewalls</b> <ul style="list-style-type: none"> <li>Introducing firewalls</li> <li>Types of firewalls</li> <li>Different firewall strategies</li> </ul>                                                                                                                                                                                        |
| <b>Week 9</b>                                                     | <b>Intrusion Prevention System (IPS)</b> <ul style="list-style-type: none"> <li>the role played by a detector</li> <li>differences between an IDS and an IPS</li> <li>types of IPS <ul style="list-style-type: none"> <li>host-based IPS</li> <li>network-based IPS</li> </ul> </li> <li>modes of using an IPS</li> <li>types of alarms</li> </ul> |
| <b>Week 10</b>                                                    | <ul style="list-style-type: none"> <li>modes of detecting malicious traffic</li> <li>severity levels of signatures</li> <li>monitoring and management of alarms and alerts</li> </ul>                                                                                                                                                              |
| <b>Week 11</b>                                                    | <b>Securing a Local Network</b> <ul style="list-style-type: none"> <li>Types of attacks on Layer 2</li> <li>The best security practices for protecting Layer</li> </ul>                                                                                                                                                                            |
| <b>Week 12</b>                                                    | <b>Network Security Protocols in Practice</b>                                                                                                                                                                                                                                                                                                      |
| <b>Week 13</b>                                                    | <b>Legal Issues and Ethics</b> <ul style="list-style-type: none"> <li>Protecting programs and data</li> <li>Computer crime statutes and the legal process</li> <li>Unique characteristics of digital objects</li> <li>Ethics: principles and situations to explore</li> </ul>                                                                      |
| <b>Week 14</b>                                                    | Final Project Presentation                                                                                                                                                                                                                                                                                                                         |
| <b>Week 15</b>                                                    | A preparatory week before the Final Exam                                                                                                                                                                                                                                                                                                           |

| Learning and Teaching Resources |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |
|                                 | Text                                                                                                                                                                                                                                                                                                                                                                                                                            | Available in the Library? |
| Required Texts                  |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |
| Recommended Texts               | <ol style="list-style-type: none"> <li>1. A. Sadiqu, Computer Network Security, Wiley-ISTE, 2020.</li> <li>2. J. Wang Z. A. Kissel, Introduction to Network Security Theory and Practice, 2<sup>nd</sup> Edition, John Wiley &amp; Sons Singapore, 2019.</li> <li>3. Charles Pfleeger, Shari Lawrence Pfleeger, Lizzie Coles-Kemp, Security in Computing, 6<sup>th</sup> Edition, Addison-Wesley Professional, 2023.</li> </ol> | 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                       | WEB APPLICATION DEVELOPMENT |                               | 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                        | CSC35122                    |                               |                                                                                                                                                                                                                                                     |                              |
| ECTS Credits                       | 5                           |                               |                                                                                                                                                                                                                                                     |                              |
| SWL (hr/sem)                       | 125                         |                               |                                                                                                                                                                                                                                                     |                              |
| Module Level                       | 3                           | Semester of Delivery          |                                                                                                                                                                                                                                                     | 5                            |
| Administering Department           | CSC                         | College                       | Type College Code                                                                                                                                                                                                                                   |                              |
| Module Leader                      | Maysa Ibrahim Abdulhussain  |                               | e-mail                                                                                                                                                                                                                                              | Maysaa.i@sc.uobaghdad.edu.iq |
| Module Leader's Acad. Title        | Lecturer                    | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                               |                              |
| Module Tutor                       | Name (if available)         |                               | e-mail                                                                                                                                                                                                                                              | E-mail                       |
| Peer Reviewer Name                 | Name                        |                               | e-mail                                                                                                                                                                                                                                              | E-mail                       |
| Scientific Committee Approval Date | 6/8/2025                    | Version Number                | 1.0                                                                                                                                                                                                                                                 |                              |

| Relation with other Modules       |                       |  |          |   |
|-----------------------------------|-----------------------|--|----------|---|
| العلاقة مع المواد الدراسية الأخرى |                       |  |          |   |
| Prerequisite module               | Web design (CSC24018) |  | Semester | 4 |
| Co-requisites module              |                       |  | Semester |   |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Module Objectives                                        | أهداف المادة الدراسية<br>1. Understand the fundamentals of web application development: The module should provide an introduction to the basics of web application development, including client-side and server-side technologies, web protocols, and web development frameworks.<br>2. Learn HTML, CSS, and PHP: Students should acquire the skills necessary to create the structure, style, and behavior of web pages using HTML for markup, CSS for styling, and PHP for client-side interactivity. |

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                          | <p>3. Explore server-side programming languages: The module should cover server-side programming languages like C#, PHP.</p> <p>4. Understand web development frameworks: Students should be introduced to popular web development frameworks such as XAMP</p> <p>5. Database integration: The module should cover the integration of web applications with databases. Students should learn how to connect to databases, (Create, Read, Update, Delete), and handle data validation and security.</p> <p>6. Implement user authentication and authorization: Students should understand the concepts of user authentication and authorization and learn how to implement them in web applications. This includes managing user sessions, user roles, and implementing secure login and registration processes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Module Learning Outcomes</b><br/>مخرجات التعلم للمادة الدراسية</p> | <p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <ol style="list-style-type: none"> <li>1. Building Interactive Web Pages: Students should be able to design and create interactive web pages using HTML, CSS, and PHP. They should be able to incorporate user input, handle events, and dynamically manipulate web page elements.</li> <li>2. Backend Development: Students should be familiar with server-side programming languages such as Python, PHP, or Node.js. They should be able to develop server-side code to handle requests, interact with databases, and perform server-side processing.</li> <li>3. Database Integration: Students should understand how to integrate databases into web applications. They should be able to design and create database schemas, perform basic CRUD (Create, Read, Update, Delete) operations, and handle data validation and security.</li> <li>4. Web Application Frameworks: Students should be introduced to popular web application frameworks</li> <li>5. Responsive Web Design: Students should understand the principles of responsive web design and be able to create web applications that adapt and display properly across different devices and screen sizes.</li> <li>6. Web Services and APIs: Students should be introduced to the concept of web services and application programming interfaces (APIs).</li> </ol> |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p>Bottom of Form</p> <p>Indicative content for web application development can include various components and topics that are essential for building a web application. Here are some indicative content areas:</p> <p>1)Introduction to Web Application Development:(15hr)</p> <p>Overview of web application development</p> <p>Client-server architecture</p> <p>Basics of web technologies (HTML, CSS, JavaScript)</p> <p>2)Back-end Development:(15 hr)</p> <p>Server-side programming languages (e.g. PHP)</p> <p>Database integration and management (e.g., SQL, MongoDB)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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|  | <p>Web frameworks and libraries (e.g., Django, Laravel, Express)</p> <p>3) APIs and Data Integration (15hr)</p> <p>RESTful APIs and API design principles</p> <p>Consuming and integrating third-party APIs</p> <p>Data formats (e.g., JSON, XML) and data handling techniques</p> <p>4) Testing and Debugging: (15hr)</p> <p>Unit testing and test-driven development (TDD)</p> <p>Debugging techniques and tools</p> <p>Cross-browser and cross-platform compatibility testing</p> <p>4) Deployment and Hosting: (15hr)</p> <p>Web hosting options and considerations</p> <p>Continuous integration and deployment (CI/CD) pipelines</p> <p>Cloud platforms and server configuration</p> <p>5) Performance Optimization: ( 15hr)</p> <p>Website performance metrics and optimization strategies</p> <p>Caching techniques and content delivery networks (CDNs)</p> <p>6) Project Management and Version Control (15 hr)</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Learning and Teaching Strategies

#### 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 types of simple experiments involving some sampling activities that are interesting to the students.</p> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

#### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

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

| Module Evaluation     |                 |             |                     |                |                           |
|-----------------------|-----------------|-------------|---------------------|----------------|---------------------------|
| تقييم المادة الدراسية |                 |             |                     |                |                           |
|                       |                 | Time/Number | Weight (Marks)      | Week Due       | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 3           | 5% (5)              | 3,5 and 10     | All                       |
|                       | Assignments     | 2           | 5% (5)              | 2 and 12       | All                       |
|                       | Projects / Lab. | 1           | 15% (15)            | Continuou<br>s | All                       |
|                       | Report          | 1           | 5% (5)              | 13             | All                       |
| Summative assessment  | Midterm Exam    | 2hr         | 20% (20)            | 7              | All                       |
|                       | Final Exam      | 3hr         | 50% (50)            | 16             | All                       |
| Total assessment      |                 |             | 100%<br>(100 Marks) |                |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                                                                                                                                                                                                                  |
|                                 | Material Covered                                                                                                                                                                                                                                                                                                                                 |
| Week 1                          | Introduction to PHP<br>Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression.                                                                                                                                                                                                                  |
| Week 2                          | Variables, Data Types, and Operators<br>Declaring and using variables in PHP<br>Different data types in PHP (e.g., strings, integers, floats, booleans)<br>Operators for mathematical, logical, and comparison operations<br>Decisions and loop<br>Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html. |
| Week 3                          | Function<br>What is a function, Define a function, Call by value and Call by reference, Recursive function, String<br>Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function                                                                                                            |
| Week 4                          | Array<br>Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function.                                                                                                                      |

|                |                                                                                                                                                                                                                                              |
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| <b>Week 5</b>  | Handling Html Form with Php<br>Capturing Form, Data Dealing with Multi-value filed.                                                                                                                                                          |
| <b>Week 6</b>  | Handling Html Form with Php<br>Generating File uploaded form, redirecting a form after submission.                                                                                                                                           |
| <b>Week 7</b>  | Mid-term Exam                                                                                                                                                                                                                                |
| <b>Week 8</b>  | Working with file and Directories<br>Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.                 |
| <b>Week 9</b>  | Session and Cookie<br>Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session. |
| <b>Week 10</b> | Database Connectivity with MySql<br>Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (                                                                                                        |
| <b>Week 11</b> | Database Connectivity with MySql<br>(Insert, Delete, Update, Select), Setting query parameter, Executing query- Join (Cross joins, Inner joins, Outer Joins, Self joins.)                                                                    |
| <b>Week 12</b> | Second mid-term exam                                                                                                                                                                                                                         |
| <b>Week 13</b> | Exception Handling<br>Understanding Exception and error, Try, catch, throw. Error tracking and debugging.                                                                                                                                    |
| <b>Week 14</b> | PHP Forms and User Input<br>Handling user input from HTML forms<br>Using superglobal arrays (e.g., \$_GET, \$_POST) to access form data<br>Validating and sanitizing user input                                                              |
| <b>Week 15</b> | Handling Errors and Exceptions<br>Debugging techniques and tools in PHP<br>Error handling mechanisms (e.g., error reporting, exception handling)<br>Custom error and exception handling                                                      |
| <b>Week 16</b> | Preparatory week before the final Exam                                                                                                                                                                                                       |



| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المناهج الاسبوعي للمختبر |                       |
|-------------------------------------------------------------------------|-----------------------|
|                                                                         | Material Covered      |
| <b>Week 1</b>                                                           | Basic PHP syntax      |
| <b>Week 2</b>                                                           | Decisions and loops   |
| <b>Week 3</b>                                                           | functions             |
| <b>Week 4</b>                                                           | Arrays                |
| <b>Week 5</b>                                                           | HTML forms & PHP      |
| <b>Week 6</b>                                                           | Files and directories |
| <b>Week 7</b>                                                           | Sessions and Cookies  |
| <b>Week 8</b>                                                           | MySQL database        |
| <b>Week 9</b>                                                           | Exception handling    |
| <b>Week 10</b>                                                          | Advanced features     |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                                                                                                                                                                                            |                           |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                                                                                                                                                                                                                                                                                                                                                                       | Available in the Library? |
| <b>Required Texts</b>                                           | Learning PHP, MySQL, books by O riley Press                                                                                                                                                                                                                                                                                                                                                                | Yes                       |
| <b>Recommended Texts</b>                                        | PHP and MySQL Web Development" by Luke Welling and Laura Thomson - This book covers the fundamentals of PHP and MySQL for web development, including database integration, form handling, security, and more. It provides practical examples and step-by-step tutorials. You can find it at <a href="https://www.phpandmysqlbook.com/">https://www.phpandmysqlbook.com/</a> .                              | No                        |
| <b>Websites</b>                                                 | "Learning PHP, MySQL & JavaScript" by Robin Nixon - This book is a comprehensive guide to web development using PHP, MySQL, and JavaScript. It covers the basics of each language and demonstrates how they can be used together to build dynamic web applications. More information can be found at <a href="http://www.learningphpmysqljavascript.com/">http://www.learningphpmysqljavascript.com/</a> . |                           |

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                                             |                               |                                                                                                                                                                                                          |
|------------------------------------|-------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                                             |                               |                                                                                                                                                                                                          |
| Module Title                       | SOFTWARE ENGINEERING                                        |                               | Module Delivery                                                                                                                                                                                          |
| Module Type                        | CORE                                                        |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | CSC35123                                                    |                               |                                                                                                                                                                                                          |
| ECTS Credits                       | 4                                                           |                               |                                                                                                                                                                                                          |
| SWL (hr/sem)                       | 100                                                         |                               |                                                                                                                                                                                                          |
| Module Level                       | 3                                                           | Semester of Delivery          | 5                                                                                                                                                                                                        |
| Administering Department           | CSC                                                         | College                       |                                                                                                                                                                                                          |
| Module Leader                      | 1- Dr. Faten Abed Ali Dawood<br>2- Dr. Safaa Khalil Mortada | e-mail                        | <a href="mailto:faten.dawood@sc.uobaghdad.edu.iq">faten.dawood@sc.uobaghdad.edu.iq</a><br><a href="mailto:safaa.alwajidi@sc.uobaghdad.edu.iq">safaa.alwajidi@sc.uobaghdad.edu.iq</a>                     |
| Module Leader's Acad. Title        | Lecturer                                                    | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                    |
| Module Tutor                       |                                                             | e-mail                        |                                                                                                                                                                                                          |
| Peer Reviewer Name                 |                                                             | e-mail                        |                                                                                                                                                                                                          |
| Scientific Committee Approval Date | 6/8/2025                                                    | Version Number                | 1.0                                                                                                                                                                                                      |

| Relation with other Modules       |                    |          |     |
|-----------------------------------|--------------------|----------|-----|
| العلاقة مع المواد الدراسية الأخرى |                    |          |     |
| Prerequisite module               | CSC11003, CSC23110 | Semester | 1,3 |
| Co-requisites module              | None               | Semester |     |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Objectives</b><br/>أهداف المادة الدراسية</p>                | <ol style="list-style-type: none"> <li>1. To gain understanding of design, implementation and testing methods in the context of software engineering.</li> <li>2. To help students have a broad understanding of software engineering applications by analyzing user requirements for designing and implementing the software product according to generally accepted standards.</li> <li>3. To develop group working skills by understanding the labor market requirements and documenting large systems.</li> <li>4. Helps student to develop and maintain software systems by identifying modern technologies.</li> <li>5. To understand the role of project management.</li> <li>6. Introduce state-of-the-art tools and techniques for large-scale software systems development.</li> <li>7. Implement the major software development methods in practical projects.</li> </ol>                                                                                                                                                                                                              |
| <p><b>Module Learning Outcomes</b><br/>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Have knowledge about the importance of software systems and their applications in the labor market.</li> <li>2. Understand the characteristics of the newly used models in software analysis and design.</li> <li>3. Knowing how to obtain user requirements for the software system through field studies and labor market requirements.</li> <li>4. Have knowledge of the initial phases of the software engineering lifecycle, i.e. requirements engineering, software design and be able to apply them in a large-scale industrial setting.</li> <li>5. Knowing the use of modern technologies and methods to analyze user requirements through deduction and analysis skills to enable Students develop large software systems.</li> <li>6. Have experience of a variety of aspects of software engineering through the development of a large piece of software within a group</li> <li>7. Have experience of a variety of aspects of software engineering through the development of a large software system within a teamwork group.</li> </ol> |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><u>Part A:</u></p> <p>Students should be able to understand that producing software is an engineering task and that engineering disciplines are often applicable to it. They should also appreciate that producing software is more than just programming.</p> <ol style="list-style-type: none"> <li>a. Defining software [2 hrs]</li> <li>b. Software application domains [4 hrs] <ol style="list-style-type: none"> <li>i. Systems software</li> <li>ii. Application software</li> <li>iii. Engineering/scientific software</li> <li>iv. Embedded software</li> <li>v. Artificial intelligence software</li> </ol> </li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                            |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><u>Part B:</u></p> <p>Students should understand how models have brought useful structure to the discipline of software engineering, as well as how modern software is characterized by constant change, tight schedules and the need to meet users' expectations. They should also understand and be able to discuss both strengths and weaknesses of evolutionary process models, which were originally conceived to address these issues.</p> <p>a. Prescriptive models:</p> <p>i. Waterfall models, e.g. classic lifecycle or V model [ 4 hrs]</p> <p>ii. Incremental process models [2 hrs]</p> <p>iii. Evolutionary process models, e.g. prototyping or spiral model [4 hrs]</p> <p>iv. Concurrent models [2 hrs]</p> <p>b. Agile Software Development [4 hrs]</p> <p><u>Part C:</u></p> <p>Students are expected to be able to identify distinct sub disciplines of software engineering and to be able to identify their characteristics.</p> <p>a. Requirements analysis and specification [2 hrs]</p> <p>b. Software design and development [4 hrs]</p> <p>c. Software testing and maintenance [4 hrs]</p> <p>d. Project management [2 hrs]</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>The main strategy that will be adopted in the delivery of this module is to encourage students to participate in the exercises, while improving and expanding their critical thinking skills at the same time. This will be achieved through the following:</p> <ul style="list-style-type: none"> <li>- classroom and interactive educational programs by reflection on individual and team productive projects</li> <li>- Theoretical tests and Quizzes</li> <li>- Evaluate the homework and assignments required by discussing the reports submitted by the students</li> <li>- The theoretical midterm and final exams</li> </ul> |

| Student Workload (SWL)                                                         |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا                                        |     |                                                                           |   |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 33  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 67  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

| Module Evaluation     |              |             |                     |                |                                      |
|-----------------------|--------------|-------------|---------------------|----------------|--------------------------------------|
| تقييم المادة الدراسية |              |             |                     |                |                                      |
|                       |              | Time/Number | Weight (Marks)      | Week Due       | Relevant Learning Outcome            |
| Formative assessment  | Quizzes      | 3           | 5% (5)              | 3, 6 and 9     | LO #1, #2, #3, #4, #5 and #6, #7, #8 |
|                       | Assignments  | 2           | 10% (10)            | 3 and 12       | LO #4, #5 and #6, #7                 |
|                       | Projects     | 1           | 10% (10)            | Continuou<br>s | All                                  |
|                       | Report       | 1           | 5% (5)              | 14             | LO #6, #9 and #10                    |
| Summative assessment  | Midterm Exam | 2hr         | 20% (20)            | 10             | LO #1 - #10                          |
|                       | Final Exam   | 3hr         | 50% (50)            | 16             | All                                  |
| Total assessment      |              |             | 100%<br>(100 Marks) |                |                                      |

| Delivery Plan (Weekly Syllabus) |                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                    |
|                                 | Material Covered                                                                   |
| Week 1                          | Introduction to Software Engineering                                               |
| Week 2                          | Software process models – Part1(Waterfall , V-shaped and Evolutionary Prototyping) |
| Week 3                          | Software process models – Part2(Incremental development , Spiral model)            |
| Week 4                          | Agile Software Development                                                         |
| Week 5                          | Scaling Agile Methods                                                              |
| Week 6                          | Requirements engineering process                                                   |
| Week 7                          | Functional & Non-Functional Requirements                                           |
| Week 8                          | System modeling & Architecture design                                              |

|                |                                                           |
|----------------|-----------------------------------------------------------|
| <b>Week 9</b>  | Software development (design and Implementation )         |
| <b>Week 10</b> | Software Testing & Evaluation                             |
| <b>Week 11</b> | Software Management (Project scheduling & Agile planning) |
| <b>Week 12</b> | Object-Oriented design using UML                          |
| <b>Week 13</b> | Software Product lifecycle- Case study examples           |
| <b>Week 14</b> | Team- Work Presentation – Part1                           |
| <b>Week 15</b> | Team- Work Presentation – Part2                           |

| <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>                                                  | Software Engineering, 10th Edition<br>by Ian Sommerville, 2016                                                                                                                               | No                               |
| <b>Recommended Texts</b>                                               | 1- Software Engineering: A Practitioner's Approach, 8th Edition by Roger S. Pressman, Bruce Maxim, 2015<br><br>2- Introduction to Software Engineering, 2nd Edition by Ronald J. Leach, 2016 | No                               |
| <b>Websites</b>                                                        | <a href="https://www.tutorialspoint.com/software_engineering/index.htm">https://www.tutorialspoint.com/software_engineering/index.htm</a>                                                    |                                  |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b>                                                                                                                                                                                                                                                                                                                                         |                         |                     |                |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|----------------|---------------------------------------|
| <b>Group</b>                                                                                                                                                                                                                                                                                                                                                                         | <b>Grade</b>            | <b>التقدير</b>      | <b>Marks %</b> | <b>Definition</b>                     |
| <b>Success Group (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 (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                       | COMPUTER ARCHITECTURE      |                               | Module Delivery                                                                                                                                                                                                                                     |                              |
| Module Type                        | CORE                       |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input checked="" type="checkbox"/> Seminar |                              |
| Module Code                        | CSC35124                   |                               |                                                                                                                                                                                                                                                     |                              |
| ECTS Credits                       | 4                          |                               |                                                                                                                                                                                                                                                     |                              |
| SWL (hr/sem)                       | 100                        |                               |                                                                                                                                                                                                                                                     |                              |
| Module Level                       | 3                          | Semester of Delivery          |                                                                                                                                                                                                                                                     | 5                            |
| Administering Department           | CSC                        | College                       | Type College Code                                                                                                                                                                                                                                   |                              |
| Module Leader                      | Nahlah Abdulrahman Hussein |                               | e-mail                                                                                                                                                                                                                                              | nahlah.a@sc.uobaghdad.edu.iq |
| Module Leader's Acad. Title        | Lecturer                   | Module Leader's Qualification | Master                                                                                                                                                                                                                                              |                              |
| Module Tutor                       | Name (if available)        | e-mail                        | E-mail                                                                                                                                                                                                                                              |                              |
| Peer Reviewer Name                 | Name                       | e-mail                        | E-mail                                                                                                                                                                                                                                              |                              |
| Scientific Committee Approval Date | 6/8/2025                   | Version Number                | 1.0                                                                                                                                                                                                                                                 |                              |

| Relation with other Modules       |                              |          |       |
|-----------------------------------|------------------------------|----------|-------|
| العلاقة مع المواد الدراسية الأخرى |                              |          |       |
| Prerequisite module               | CSC11002, CSC12007, CSC23110 | Semester | 1,2,3 |
| Co-requisites module              | None                         | Semester |       |



## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br>أهداف المادة الدراسية                | <ol style="list-style-type: none"> <li>1. Understand the computer system and basic computer components.</li> <li>2. To understand all physical aspects of computer systems e.g., circuit design, control signals, and memory types.</li> <li>3. To understand the input/output organization and peripheral devices.</li> <li>4. Understand interface as a shared boundary between two separate components of the computer system for communication purposes.</li> <li>5. To understand computer memory as the storage space in the computer and learn its types.</li> <li>6. To learn the concept of multicore, multiprocessor, and multiprogramming Systems.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. Identify the computer organization and its basic components.</li> <li>2. Learn how the various computer components communicating with each other.</li> <li>3. List and understand the various types of computer memory.</li> <li>4. Arranging different kinds of storage present on a computing device based on the speed of access.</li> <li>5. Summarize what is meant by a basic computer architecture.</li> <li>6. Describe the mapping methods of data and instructions pulled from the RAM to cache memory.</li> <li>7. Identify the basic concept of using multicore and multiprocessor computers and their impact on performance enhancement.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p><u>Part A - Computer Architecture Components</u></p> <ul style="list-style-type: none"> <li>– Input / output organization, peripheral devices, input/output interfaces, programming input/output devices. [4 hrs]</li> <li>- I/O Programming Techniques – Programmed I/O, Interrupt Initiated I/O, interrupt vector table, Direct Memory Access, direct memory access controller. [6 hrs]</li> </ul> <p>Revision problem classes [2 hrs]</p> <p><u>Part B – Memory System</u></p> <ul style="list-style-type: none"> <li>- Memory definition, memory types, memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, cache mapping, fully associative mapping, direct mapping, set associative mapping. [8 hrs]</li> <li>- Instruction and data cache, types of instruction and data types, write techniques of instruction and data. [6 hrs]</li> </ul> <p><u>Part C – Multicore, Multiprocessor, and Multiprogramming Systems.</u></p> <ul style="list-style-type: none"> <li>- Introduction to multicore and multiprocessor systems, classification of multiprocessors by the way their memory is organized, multiprogramming system. {4 hrs]</li> </ul> |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The strategy that will be adopted in introducing this unit is to introduce operational units and their interrelationships that fulfill the architectural specifications of a digital computer system and make students aware of how data is processed, stored, and transmitted within a computer system. This is done by encouraging students to take advantage of the provided study materials by selecting and specifying the specifications of the devices they choose to build a computer system with good specifications and a reasonable cost. |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 33  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 67  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

## Module Evaluation

### تقييم المادة الدراسية

|                             |                     | Time/Number | Weight (Marks)      | Week Due   | Relevant Learning Outcome |
|-----------------------------|---------------------|-------------|---------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>      | 2/ 1 hrs    | 10% (10)            | 3 and 5    | LO #1, #2 and #6, #7      |
|                             | <b>Assignments</b>  | 2           | 5% (10)             | 4 and 6    | LO #3, #4 and #5,         |
|                             | <b>seminars</b>     | 1           | 10% (10)            | Continuous | All                       |
|                             | <b>Report</b>       | 1           | 5% (10)             | 10         | LO #5, #6, and #7         |
| <b>Summative assessment</b> | <b>Midterm Exam</b> | 1hr         | 10% (10)            | 7          | LO #4 - #5- #6 - #7       |
|                             | <b>Final Exam</b>   | 3hr         | 60% (50)            | 16         | All                       |
| <b>Total assessment</b>     |                     |             | 100%<br>(100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                        |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                |
| <b>Week 1</b>                                                     | Introduction to the computer architecture                                                                              |
| <b>Week 2</b>                                                     | Programming I/O Devices techniques                                                                                     |
| <b>Week 3</b>                                                     | Programmed I/O technique                                                                                               |
| <b>Week 4</b>                                                     | Interrupt technique                                                                                                    |
| <b>Week 5</b>                                                     | Direct Memory Access technique                                                                                         |
| <b>Week 6</b>                                                     | The 8259A Programmable Interrupt Controller                                                                            |
| <b>Week 7</b>                                                     | <ul style="list-style-type: none"> <li>- Memory system</li> <li>- Memory Hierarchy</li> </ul>                          |
| <b>Week 8</b>                                                     | Associative Memory                                                                                                     |
| <b>Week 9</b>                                                     | Cache Memory                                                                                                           |
| <b>Week 10</b>                                                    | Cache Memory Organizations                                                                                             |
| <b>Week 11</b>                                                    | Fully associative mapping<br>Direct mapping                                                                            |
| <b>Week 12</b>                                                    | Set-associative mapping<br>Fetch and write mechanism                                                                   |
| <b>Week 13</b>                                                    | Multiprocessor system <ul style="list-style-type: none"> <li>a. Tightly coupled</li> <li>b. Loosely coupled</li> </ul> |
| <b>Week 14</b>                                                    | Multiprogramming system                                                                                                |
| <b>Week 15</b>                                                    | Multi-Core Architecture                                                                                                |
| <b>Week 16</b>                                                    | Preparatory week before the final Exam                                                                                 |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |
|-------------------------------------------------------------------------|
| <b>None</b>                                                             |

## Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                                                                                                           | Available in the Library? |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Computer Organization and Architecture<br>Designing for Performance, tenth Edition<br>William Stalling, Copyright © 2016, 2013, 2010<br>Pearson Education, Inc.                                                                                                                                                                                                | No                        |
| <b>Recommended Texts</b> | - Modern Computer Architecture and Organization<br>Jim Ledin, Copyright Year: 2020<br>- Computer Architecture: Fundamentals and Principles of<br>Computer Design.<br>Joseph D. Dumas II · 2018                                                                                                                                                                 | No                        |
| <b>Websites</b>          | <a href="https://www.spiceworks.com/tech/tech-general/articles/what-is-computer-architecture/">https://www.spiceworks.com/tech/tech-general/articles/what-is-computer-architecture/</a><br><a href="https://www.javatpoint.com/computer-organization-and-architecture-tutorial">https://www.javatpoint.com/computer-organization-and-architecture-tutorial</a> |                           |

## Grading Scheme

مخطط الدرجات

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

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

Level Three  
(UGIII)  
Semester Six

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                 |                               |                                                                                                                                                                                                                                                     |
|------------------------------------|---------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                 |                               |                                                                                                                                                                                                                                                     |
| Module Title                       | MOBILE APPLICATIONS DEVELOPMENT |                               | 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                        | CSC36125                        |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 6                               |                               |                                                                                                                                                                                                                                                     |
| SWL (hr/sem)                       | 150                             |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | 3                               | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | Type Dept. Code                 | College                       | Type College Code                                                                                                                                                                                                                                   |
| Module Leader                      | Alyaa Al-barrak                 |                               | e-mail: alyaa.al-barrak@sc.uobaghdad.edu.iq                                                                                                                                                                                                         |
| Module Leader's Acad. Title        | Lecturer                        | Module Leader's Qualification | Ph.D                                                                                                                                                                                                                                                |
| Module Tutor                       | Salaw Aqeel Mahdi               |                               | e-mail: salwa.aqeel@sc.uobaghdad.edu.iq                                                                                                                                                                                                             |
| Peer Reviewer Name                 |                                 | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Scientific Committee Approval Date | 6/8/2025                        | Version Number                | 1.0                                                                                                                                                                                                                                                 |

| Relation with other Modules       |          |          |  |
|-----------------------------------|----------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |          |          |  |
| Prerequisite module               | CSC23111 | Semester |  |
| Co-requisites module              | None     | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Module Objectives</b><br>أهداف المادة الدراسية        | <ol style="list-style-type: none"> <li>1. Understanding Mobile Devices: The course aims to help students gain knowledge about the various types of mobile devices, their operating systems, and how they function and develop applications.</li> <li>2. Mobile Programming Concepts: Students are expected to learn and identify various concepts of mobile programming that make it unique from programming for other platforms.</li> <li>3. Mobile Application Development Frameworks: Students will understand mobile application development frameworks, architecture, design, and engineering issues; techniques; and methodologies for mobile application development.</li> </ol> |

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                          | <p>4. User Interface Design: Students should be learning user-interface design for mobile applications.</p> <p>5. Managing Application Data: Students can understand how to manage application data and database.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><b>Module Learning Outcomes</b><br/>مخرجات التعلم للمادة الدراسية</p> | <p>1. Understanding the Mobile Platform: Students should be gain a foundational understanding of the .Net Maui platform, which allows them to develop applications for Android using C# and the.NET framework.</p> <p>2. Developing .Net Maui. Applications: Students could be able to build their .Net Maui. applications using Visual Studio and develop an understanding of the fundamentals of application development with .Net Maui.</p> <p>3. Effective user interface: Students should be learnt to create useful apps with easy and creative interface</p> <p>4. Database management student has been Learnt to develop apps that store and retrieve user information that persists beyond the life of the application.</p> <p>5. Critically evaluate solutions to technical problems relating to mobile computing systems</p>                                                                                                                                  |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><u>Part A –Mobile platform installation</u></p> <p>Cross-platform projects with .Net Maui [2 hrs]</p> <p>Setting up the development environment and Emulator [2 hrs]</p> <p>Creating a cross-platform solution [2 hrs]</p> <p><u>Part B – User Interface interaction</u></p> <p>Adding UI behaviors and triggers [3hrs]</p> <p>Showing native pages with renderers [5hrs]</p> <p>Layouts / .Net Maui.Forms view elements [3hrs]</p> <p>Using styles and Creating behaviors[3hrs]</p> <p><u>Part C – DB and pluins</u></p> <p>SQLite data access[6 hrs]</p> <p>Creating cross-platform plugins [6 hrs]</p> <p><u>Part D – XamChat for Android</u></p> <p>The Android Manifest [4 hrs]</p> <p>Writing a login screen for XamChat [4 hrs]</p> <p>Android's ListView and BaseAdapter[4 hrs]</p> <p>Adding a friends list and a list of messages [4 hrs]</p> <p><u>Part E- Project</u></p> <p>Build Project [16 hrs]</p> |

| <p><b>Learning and Teaching Strategies</b><br/>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                       | <p>A combination of lectures, tutorial and practical work will be used. Lectures will consider the latest developments in mobile technology covering topics for practical work and concepts, particularly for programming .Practical work will develop programming, user-interface design and configuration skills, building on individual worksheet-based assignments. Students use .Net Maui platform to write and execute assignments as well as a project to be submitted in the end of course</p> |

| Student Workload (SWL)                                                         |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا                                        |     |                                                                           |   |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 6 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                           |   |

| Module Evaluation     |                 |             |                     |            |                           |
|-----------------------|-----------------|-------------|---------------------|------------|---------------------------|
| تقييم المادة الدراسية |                 |             |                     |            |                           |
|                       |                 | Time/Number | Weight (Marks)      | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 3           | 10% (10)            | 4,7,9      | LO #4, #7,#9              |
|                       | Assignments     | 5           | 10% (10)            |            | LO #5, #7,#10,#12,#14     |
|                       | Projects / Lab. | 2           | 15% (10)            | Continuous | All                       |
|                       | Report          | 1           | 5% (10)             |            | LO #10                    |
| Summative assessment  | Midterm Exam    | 2hr         | 10% (10)            | 13         | LO #1-12                  |
|                       | Final Exam      | 3hr         | 50% (50)            | 16         | All                       |
| Total assessment      |                 |             | 100%<br>(100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                        |
|---------------------------------|------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                        |
|                                 | Material Covered                                                       |
| Week 1                          | Introduction to .NET MAUI                                              |
| Week 2                          | Building Our First application                                         |
| Week 3                          | The Fundamentals of .NET MAUI                                          |
| Week 4                          | An Architecture to Suit You                                            |
| Week 5                          | User Interface Essentials: Prerequisites, App Icons, and Splash Screen |
| Week 6                          | User Interface Essentials: XAML, and Layouts                           |
| Week 7                          | User Interface Essentials: Data Binding, and Shell.                    |
| Week 8                          | Creating Our Own Layout: Placeholder, ILayoutManager, and BoardLayout  |



|                |                                                                      |
|----------------|----------------------------------------------------------------------|
| <b>Week 9</b>  | Creating Our Own Layout: FixedLayoutManager, and Using Your Layout   |
| <b>Week 10</b> | Accessibility                                                        |
| <b>Week 11</b> | How to Make Your Application Accessible                              |
| <b>Week 12</b> | Testing Your Application's Accessibility and Accessibility Checklist |
| <b>Week 13</b> | Advanced UI Concepts : Adding the Ability to Add a Widget to a Board |
| <b>Week 14</b> | Advanced UI Concepts: Styling.                                       |
| <b>Week 15</b> | Advanced UI Concepts: Triggers                                       |
| <b>Week 16</b> | Preparatory week before the final Exam                               |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|                | Material Covered                  |
|----------------|-----------------------------------|
| <b>Week 1</b>  | Review for C# language            |
| <b>Week 2</b>  | Installing visual studio and Maui |
| <b>Week 3</b>  | Develop an application for Mobil  |
| <b>Week 4</b>  | Develop an application for Mobil  |
| <b>Week 5</b>  | Develop an application for Mobil  |
| <b>Week 6</b>  | Develop an application for Mobil  |
| <b>Week 7</b>  | Develop an application for Mobil  |
| <b>Week 8</b>  | Develop an application for Mobil  |
| <b>Week 9</b>  | Develop an application for Mobil  |
| <b>Week 10</b> | Develop an application for Mobil  |
| <b>Week 11</b> | Develop an application for Mobil  |
| <b>Week 12</b> | Develop an application for Mobil  |
| <b>Week 13</b> | Develop an application for Mobil  |
| <b>Week 14</b> | Develop an application for Mobil  |
| <b>Week 15</b> | Develop an application for Mobil  |

| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                               |                           |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                          | Text                                                                                                                                                                                                                                          | Available in the Library? |
| <b>Required Texts</b>                                    | Introducing .NET MAUI: Build and Deploy Cross-platform Applications, Using C# and .NET, Multi-platform App UI                                                                                                                                 | No                        |
| <b>Recommended Texts</b>                                 | .NET MAUI for C# Developers: by Jesse Liberty, Rodrigo Juarez                                                                                                                                                                                 | No                        |
| <b>Recommended Texts</b>                                 | .NET Multi-platform App UI documentation                                                                                                                                                                                                      |                           |
| <b>Websites</b>                                          | <a href="https://learn.microsoft.com/en-us/dotnet/maui/get-started/installation?view=net-maui-9.0&amp;tabs=visual-studio">https://learn.microsoft.com/en-us/dotnet/maui/get-started/installation?view=net-maui-9.0&amp;tabs=visual-studio</a> |                           |

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

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                       |                               |                                                                                                                                                                                                                                                     |
|------------------------------------|-----------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                       |                               |                                                                                                                                                                                                                                                     |
| Module Title                       | Computer Graphics     |                               | 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                        | CSC36126              |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 6                     |                               |                                                                                                                                                                                                                                                     |
| SWL (hr/sem)                       | 150                   |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | 3                     | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | Computer Science      | College                       | Science                                                                                                                                                                                                                                             |
| Module Leader                      | Husam Ali Abdulmohsin | e-mail                        | Husam.a@sc.uobaghdad.edu.iq                                                                                                                                                                                                                         |
| Module Leader's Acad. Title        | Asst. Professor       | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                               |
| Module Tutor                       | Name (if available)   | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Peer Reviewer Name                 | Name                  | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Scientific Committee Approval Date | 6/8/2025              | Version Number                | 1.0                                                                                                                                                                                                                                                 |

| Relation with other Modules       |          |          |   |
|-----------------------------------|----------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |          |          |   |
| Prerequisite module               | CSC23110 | Semester | 3 |
| Co-requisites module              | None     | Semester |   |

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br>أهداف المادة الدراسية                   | <ol style="list-style-type: none"> <li>1- A short overview of computer graphics, introducing many concepts that will be covered in much more detail in the rest of this semester.</li> <li>2- Two-dimensional graphics in Java will be explained, with an emphasis on ideas such as transformations and scene graphs that carry over to three dimensions.</li> <li>3- OpenGL 1.1 basic features that are still fundamental to three-dimensional computer graphics, in a form that is an easier starting point for people new to 3D graphics. Only part of the API is covered.</li> <li>4- Covers three.js, a higher-level object-oriented 3D graphics API for Web graphics using JavaScript. This part shows how fundamental concepts can be used in a higher-level Preface ix interface.</li> <li>5- Cover WebGL, a modern version of OpenGL for graphics on the Web. WebGL is very low-level, and it requires the programmer to write "shader programs" to implement many features that are built into OpenGL 1.1. Looking at the implementation is an opportunity to understand more deeply how computers actually make 3D images.</li> <li>6- look very briefly at some advanced techniques that are not possible in OpenGL.</li> </ol> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم<br>للمادة الدراسية | <ol style="list-style-type: none"> <li>1. will learn the Two-dimensional graphics in Java, with an emphasis on ideas such as transformations and scene graphs.</li> <li>2. OpenGL 1.1 basic features and part of the API is taught.</li> <li>3. Will learn how to use three.js, a higher-level object-oriented 3D graphics API for Web graphics using JavaScript.</li> <li>4. Will learn WebGL, a modern version of OpenGL for graphics on the Web.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                   | <p>Indicative content includes the following.</p> <p>Fast over view to the main concepts of a programming language in general, how to input and output information, different data structures. [15 hrs]</p> <p>One-, two- and three-dimension array definition and tracing, different arithmetic operations that can be applied to arrays. [10 hrs]</p> <p>Graphics in java will be explained in details, with most general forms of graphics. [10 hrs]</p> <p>OpenGL will be described in details, with the functions and facilities available. [15 hrs]</p> <p>Revision problem classes [6 hrs]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## Learning and Teaching Strategies

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</p>                                                                     |
|                   | <p>their critical thinking programming skills in computer science. This will be achieved through classes, exercises and lab by considering types of simple experiments involving some sampling activities that are interesting to the students.</p> |

| <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 الدرا يس المنتظم للطالب أسبوعيا        | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل | 71  | <b>Unstructured SWL (h/w)</b><br>الحمل الدرا يس غ رت المنتظم للطالب أسبوعيا | 5 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي للطالب خلال الفصل                | 150 |                                                                             |   |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                  |               |                           |
|---------------------------------------------------|------------------------|-------------|------------------|---------------|---------------------------|
|                                                   |                        | Time/Number | Weight (Marks)   | Week Due      | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 4           | 10% (10)         | 3, 5, 7 and 9 | LO #1, #2, #3, and #4     |
|                                                   | <b>Assignments</b>     | 2           | 10% (10)         | 5             | LO #2                     |
|                                                   | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous    | All                       |
|                                                   | <b>Report</b>          | 0           |                  |               | LO #5, #8 and #10         |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 1.5hr       | 10% (10)         | 7             | LO #1 - #4                |
|                                                   | <b>Final Exam</b>      | 3hr         | 60% (50)         | 10            | All                       |
| <b>Total assessment</b>                           |                        |             | 100% (100 Marks) |               |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                          |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                                  |
| <b>Week 1</b>                                                     | Introduction to Painting and Drawing, Elements of 3D Graphics, Hardware and Software                                                     |
| <b>Week 2</b>                                                     | Two-Dimensional Graphics, Pixels, Coordinates, and Colors, Pixel Coordinates, Real-number Coordinate Systems, Aspect Ratio, Color Models |

|                |                                                                                                                                                                                                                                                                           |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 3</b>  | Shapes, Basic Shapes, Stroke and Fill, Polygons, Curves, and Paths                                                                                                                                                                                                        |
| <b>Week 4</b>  | Transforms, Viewing and Modeling, Translation, Rotation, Combining Transformations, Scaling, Shear, Window-to-Viewport, and Matrices and Vectors.                                                                                                                         |
| <b>Week 5</b>  | Hierarchical Modeling, Building Complex Objects, Scene Graphs, and The Transform Stack                                                                                                                                                                                    |
| <b>Week 6</b>  | Java Graphics2D, Graphics2D, Shapes, Stroke and Fill, Transforms, BufferedImage and Pixels                                                                                                                                                                                |
| <b>Week 7</b>  | HTML Canvas Graphics, The 2D Graphics Context, Shapes, Stroke and Fill, Transforms, Auxiliary Canvases, Pixel Manipulation, and Images                                                                                                                                    |
| <b>Week 8</b>  | Mid Term                                                                                                                                                                                                                                                                  |
| <b>Week 9</b>  | SVG: A Scene Description Language, SVG Document Structure, Shapes, Styles, and Transforms, Polygons and Paths, Hierarchical Models, and Animation                                                                                                                         |
| <b>Week 10</b> | OpenGL 1.1: Geometry, Shapes and Colors in OpenGL 1.1, 3D Coordinates and Transforms, Projection and Viewing, Polygonal Meshes and glDrawArrays, Some Linear Algebra, Using GLUT and JOGL                                                                                 |
| <b>Week 11</b> | Three.js: A 3D Scene Graph API, Three.js Basic, Building Objects, Other Features.                                                                                                                                                                                         |
| <b>Week 12</b> | Introduction to WebGL, The Programmable Pipeline, The WebGL Graphics Context, The Shader Program, Data Flow in the Pipeline, Values for Uniform Variables, Values for Attributes, Drawing a Primitive, WebGL 2.0: Vertex Array Objects, and WebGL 2.0: Instanced Drawing. |
| <b>Week 13</b> | First Examples, WebGL Context Options, A Bit of GLSL, The RGB Triangle in WebGL, Shape Stamper, The POINTS Primitive, and WebGL Error Handling                                                                                                                            |
| <b>Week 14</b> | 3D Graphics with WebGL, Transformations in 3D, Lighting and Material, Textures, Framebuffers, and WebGL Extensions.                                                                                                                                                       |
| <b>Week 15</b> | Beyond Basic 3D Graphics, Ray Tracing, Ray Casting, Recursive Ray Tracing,. Limitations of Ray Tracing, Path Tracing.                                                                                                                                                     |
| <b>Week 16</b> | Mid Term                                                                                                                                                                                                                                                                  |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

|                | Material Covered                |
|----------------|---------------------------------|
| <b>Week 1</b>  | Lab 1: Introduction to graphics |
| <b>Week 2</b>  | Lab 2: Two-Dimensional Graphics |
| <b>Week 3</b>  | Lab 3: Transforms               |
| <b>Week 4</b>  | Lab 4: Hierarchical Modeling    |
| <b>Week 5</b>  | Lab 5: HTML Canvas Graphics     |
| <b>Week 6</b>  | Lab 6: SVG                      |
| <b>Week 7</b>  | Lab 7: OpenGL                   |
| <b>Week 8</b>  | Lab 8: Three.js                 |
| <b>Week 9</b>  | Lab 9: Introduction to WebGL    |
| <b>Week 10</b> | Lab 10: 3D Graphics with WebGL  |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                   | Available in the Library? |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Introduction to Computer Graphics, Version 1.3, August 2021, David J. Eck, Hobart and William Smith Colleges                                                                                                                                                           | No                        |
| <b>Recommended Texts</b> | Computer Graphics Lecture Notes, CSC418 / CSCD18 / CSC2504, Computer Science Department, University of Toronto, Version: November 24, 2006.                                                                                                                            | No                        |
| <b>Websites</b>          | <a href="https://math.hws.edu/eck/cs424/downloads/graphicsbook-linked.pdf">https://math.hws.edu/eck/cs424/downloads/graphicsbook-linked.pdf</a><br><a href="https://www.dgp.toronto.edu/~hertzman/418notes.pdf">https://www.dgp.toronto.edu/~hertzman/418notes.pdf</a> |                           |

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



# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                     |                               |                                                                                                                                                                                                                                                     |                                      |
|------------------------------------|---------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| معلومات المادة الدراسية            |                     |                               |                                                                                                                                                                                                                                                     |                                      |
| Module Title                       | MACHINE LEARNING    |                               | 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                        | CSC36127            |                               |                                                                                                                                                                                                                                                     |                                      |
| ECTS Credits                       | 6                   |                               |                                                                                                                                                                                                                                                     |                                      |
| SWL (hr/sem)                       | 150                 |                               |                                                                                                                                                                                                                                                     |                                      |
| Module Level                       | 3                   | Semester of Delivery          |                                                                                                                                                                                                                                                     | 6                                    |
| Administering Department           | Type Dept. Code     | College                       | Type College Code                                                                                                                                                                                                                                   |                                      |
| Module Leader                      | Amer A. Abdulrahman |                               | e-mail                                                                                                                                                                                                                                              | amer.abdulrahman@sc.uobaghdad.edu.iq |
| Module Leader's Acad. Title        | Professor Assistant | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                               |                                      |
| Module Tutor                       | Name (if available) | e-mail                        | E-mail                                                                                                                                                                                                                                              |                                      |
| Peer Reviewer Name                 | Name                | e-mail                        | E-mail                                                                                                                                                                                                                                              |                                      |
| Scientific Committee Approval Date | 6/8/2025            | Version Number                | 1.0                                                                                                                                                                                                                                                 |                                      |

| Relation with other Modules       |                    |          |      |
|-----------------------------------|--------------------|----------|------|
| العلاقة مع المواد الدراسية الأخرى |                    |          |      |
| Prerequisite module               | CSC12009, CSC35119 | Semester | 2, 3 |
| Co-requisites module              | None               | Semester |      |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br>أهداف المادة الدراسية                                                                         | This course is a comprehensive overview of machine learning. The goal is to build an understanding of the most common machine learning models. Given the widespread use of modern machine learning techniques, there is an urgent need for programmers and system designers to improve their understanding of modern machine learning techniques.                                                                                                                                          |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | By the end of the module, students should be able to:<br>1.Principles of machine learning,<br>2.Develop an appreciation for what is involved in Learning models from data<br>3- Understand a wide variety of learning algorithms<br>4- Understand how to evaluate models generated from data<br>5-machine learning in real world<br>6. Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                                                                         | Indicative content includes the following.<br>Understand the concept of learning in computer and science.<br>Understand the difference between supervised and unsupervised learning.<br>Understand the difference between machine learning and deep learning.<br>Design and evaluate machine and deep learning algorithms.                                                                                                                                                                 |

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

| Student Workload (SWL)<br>الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا              |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 6 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                           |   |

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

| Delivery Plan (Weekly Syllabus)<br>المنهاج الاسبوعي النظري |                                        |
|------------------------------------------------------------|----------------------------------------|
|                                                            | Material Covered                       |
| Week 1                                                     | Introduction to Machine Learning       |
| Week 2                                                     | Machine learning Life cycle            |
| Week 3                                                     | Gathering Data                         |
| Week 4                                                     | Data preparation                       |
| Week 5                                                     | Data Wrangling                         |
| Week 6                                                     | Analyze Data                           |
| Week 7                                                     | Train the model                        |
| Week 8                                                     | Samples of supervise algorithms        |
| Week 9                                                     | Samples of unsupervised algorithms     |
| Week 10                                                    | Samples of reinforcement algorithms    |
| Week 11                                                    | Test the model                         |
| Week 12                                                    | Model Deployment                       |
| Week 13                                                    | Mid-term Exam                          |
| Week 14                                                    | Machine learning in real world         |
| Week 15                                                    | Applications of Machine learning       |
| Week 16                                                    | Preparatory week before the final Exam |

| Delivery Plan (Weekly Lab. Syllabus)<br>المنهاج الاسبوعي للمختبر |  |
|------------------------------------------------------------------|--|
| None                                                             |  |

| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                                                                       |                           |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                          | Text                                                                                                                                                                                                                                                                                  | Available in the Library? |
| Required Texts                                           | Fundamentals of Machine Learning for Predictive Data Analytics by John D. Kelleher, Brian Mac Namee, and Aoife D'Arcy                                                                                                                                                                 | No                        |
| Recommended Texts                                        |                                                                                                                                                                                                                                                                                       |                           |
| Websites                                                 | <a href="https://www.chegg.com/textbooks/fundamentals-of-machine-learning-for-predictive-data-analytics-1st-edition-9780262029445-0262029448">https://www.chegg.com/textbooks/fundamentals-of-machine-learning-for-predictive-data-analytics-1st-edition-9780262029445-0262029448</a> |                           |

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                |                               |                                                                                                                                                                                                                                                     |
|------------------------------------|--------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                |                               |                                                                                                                                                                                                                                                     |
| Module Title                       | Fundamental of Database System |                               | 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                        | CSC36128                       |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 6                              |                               |                                                                                                                                                                                                                                                     |
| SWL (hr/sem)                       | 150                            |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | UGx1 3                         | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | Computer Science               | College                       | Science                                                                                                                                                                                                                                             |
| Module Leader                      | Mehdi G. Duaimi                | e-mail                        | <a href="mailto:mehdi.k@sc.uobaghdad.edu.iq">mehdi.k@sc.uobaghdad.edu.iq</a>                                                                                                                                                                        |
| Module Leader's Acad. Title        | Lecturer                       | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                               |
| Module Tutor                       | Name (if available)            | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Peer Reviewer Name                 | Name                           | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Scientific Committee Approval Date | 6/8/2025                       | Version Number                | 1.0                                                                                                                                                                                                                                                 |

| Relation with other Modules       |          |          |   |
|-----------------------------------|----------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |          |          |   |
| Prerequisite module               | CSC23110 | Semester | 3 |
| Co-requisites module              | None     | Semester |   |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br>أهداف المادة الدراسية                                                                         | <ol style="list-style-type: none"> <li>1. Defining and explaining fundamental of database concepts.</li> <li>2. Designing a database schema.</li> <li>3. Executing SQL statements for data retrieval and manipulation.</li> <li>4. Understanding the role of databases in applications.</li> <li>5. Performing data modeling and schema design.</li> <li>6. Optimizing query performance.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | <p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <ol style="list-style-type: none"> <li>1. Understanding fundamental database concepts.</li> <li>2. Recognizing the role of databases in applications.</li> <li>3. Performing data modeling and schema design.</li> <li>4. The database designer is responsible for creating standards and database policies and maintenance.</li> <li>5. Query and manipulate data using SQL.</li> <li>6. Optimizing data querying for performance.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                                                                         | <p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Introduction to Databases: [10 hrs] <ul style="list-style-type: none"> <li>• Overview and applications of databases.</li> </ul> </li> <li>2. Data Models and Relational Databases: [10 hrs] <ul style="list-style-type: none"> <li>• ER modeling and relational databases.</li> </ul> </li> <li>3. Database Design: [10 hrs] <ul style="list-style-type: none"> <li>• Database design process: requirements analysis, conceptual design, and logical design.</li> </ul> </li> <li>4. Database Querying: [10 hrs] <ul style="list-style-type: none"> <li>• SQL syntax, retrieval, and manipulation.</li> </ul> </li> <li>5. Database Management and Administration: [5 hrs]</li> <li>6. Relational algebra and SQL. [15 hrs]</li> <li>7. Data Integrity and Constraints: [5 hrs] <ul style="list-style-type: none"> <li>• Keys, referential integrity, and constraints.</li> </ul> </li> </ol> |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | Instructors aim to consolidate active learning and critical thinking by engaging students in practical activities such as designing database schemas, writing SQL queries, and solving real-world database challenges. The strategy encourages collaboration, independent problem-solving, and the use of technology tools to enhance the learning experience. This will be achieved through classes, interactive tutorials and by considering types of various lab. assignments; involving some activities that are interesting to the students. |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 64  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 86  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 6 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                           |   |

## Module Evaluation

### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)      | Week Due       | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|---------------------|----------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)            | 4 and 11       | LO #1, #2 and #5          |
|                             | <b>Assignments</b>     | 2           | 5% (5)              | 2 and 10       | LO #3, #4 and #6          |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)            | Continuou<br>s | All                       |
|                             | <b>Report</b>          | 1           | 5% (5)              | 13             | LO #2, #5 and #6          |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2hr         | 20% (20)            | 7              | LO #1 -- #6               |
|                             | <b>Final Exam</b>      | 3hr         | 50% (50)            | 16             | All                       |
| <b>Total assessment</b>     |                        |             | 100%<br>(100 Marks) |                |                           |

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|                | Material Covered                                                    |
|----------------|---------------------------------------------------------------------|
| <b>Week 1</b>  | Database System Concepts                                            |
| <b>Week 2</b>  | Database Architecture                                               |
| <b>Week 3</b>  | Database Management System                                          |
| <b>Week 4</b>  | Database Schema & Database Users                                    |
| <b>Week 5</b>  | The Entity Relationship Data Model                                  |
| <b>Week 6</b>  | Relational Integrity<br>& The Enhanced E-R Model and Business Rules |
| <b>Week 7</b>  | Conceptual Design with the ER Model                                 |
| <b>Week 8</b>  | Queries and Updates in SQL                                          |
| <b>Week 9</b>  | The Relational Data Model                                           |
| <b>Week 10</b> | Mapping from ER Diagrams to Relational Model                        |
| <b>Week 11</b> | SQL and DBMS Functionality                                          |
| <b>Week 12</b> | Constraints and Keys                                                |
| <b>Week 13</b> | Defining a Relation Schema in SQL                                   |
| <b>Week 14</b> | DBMS Generalization & Specialization                                |
| <b>Week 15</b> | Relational Algebra Syntax and Semantics                             |
| <b>Week 16</b> | Preparatory week before the final Exam                              |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|                | Material Covered                                                       |
|----------------|------------------------------------------------------------------------|
| <b>Week 1</b>  | Main MS Office Access Objects                                          |
| <b>Week 2</b>  | Planning a Database Design Structure; Creating and working with Tables |
| <b>Week 3</b>  | Creating tables using datasheet view                                   |
| <b>Week 4</b>  | Creating tables using design view; Field grid pane; Field properties   |
| <b>Week 5</b>  | Lookup tab and lookup wizard; Format and input mask properties         |
| <b>Week 6</b>  | Importing and Linking from an External Source;                         |
| <b>Week 7</b>  | Splitting the database into front end and backend                      |
| <b>Week 8</b>  | Types of keys and relational integrity; Setting Primary Key            |
| <b>Week 9</b>  | Setting Index Properties; Setting Table Properties                     |
| <b>Week 10</b> | Setting Relationships between Tables; Setting Foreign Key              |
| <b>Week 11</b> | Introduction to SQL and Query types;                                   |
| <b>Week 12</b> | Creating and working with Queries (QBE)                                |
| <b>Week 13</b> | Creating and working with SQL view                                     |
| <b>Week 14</b> | Data Definition Language; Data Control Language (database security)    |
| <b>Week 15</b> | Preparatory week before the final Exam                                 |



| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                                                                                                                                                                            |                           |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                          | Text                                                                                                                                                                                                                                                                                                                                                                                       | Available in the Library? |
| <b>Required Texts</b>                                    | <ul style="list-style-type: none"> <li>➤ Raghu Ramakrishnan , Johannes Gehrke, "Database Management Systems", 4th Edition, McGraw Hill, 2018.</li> <li>➤ S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management Systems", Springer, 2007.</li> </ul>                                                                                                                  | As a pdf                  |
| <b>Recommended Texts</b>                                 | <ul style="list-style-type: none"> <li>➤ David M. Kroenke, David J. Auer. "Database processing : fundamentals, design, and implementation."—Edition 15, Pearson Education, Prentice Hall. 2018.</li> <li>➤ Mike McGrath. 'Access in easy steps: Illustrated using Access 2019 Paperback. In Easy Steps Limited (2019).</li> </ul>                                                          | As a pdf                  |
| <b>Websites</b>                                          | <ul style="list-style-type: none"> <li>➤ <a href="https://www.inderscience.com/jhome.php?jcode=ijjids">https://www.inderscience.com/jhome.php?jcode=ijjids</a></li> <li>➤ <a href="https://www.sciencedirect.com/topics/immunology-and-microbiology/database-management-system">https://www.sciencedirect.com/topics/immunology-and-microbiology/database-management-system</a></li> </ul> |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                         |                     |          |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks %  | Definition                            |
| <b>Success Group (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 (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                       | CRYPTOGRAPHY                |                               | 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                        | CSC36129                    |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 5                           |                               |                                                                                                                                                                                                                                                     |
| SWL (hr/sem)                       | 125                         |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | 3                           | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | Computer Science department | College                       | College of Science                                                                                                                                                                                                                                  |
| Module Leader                      | Sarab M. Hameed             | e-mail                        | sarab.m@sc.uobaghdad.edu.iq                                                                                                                                                                                                                         |
| Module Leader's Acad. Title        | Professor                   | Module Leader's Qualification |                                                                                                                                                                                                                                                     |
| Module Tutor                       | Name (if available)         | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Peer Reviewer Name                 | Name                        | e-mail                        | E-mail                                                                                                                                                                                                                                              |
| Scientific Committee Approval Date | 5/8/2025                    | Version Number                | 1.0                                                                                                                                                                                                                                                 |

| Relation with other Modules       |                    |          |   |
|-----------------------------------|--------------------|----------|---|
| العلاقة مع المواد الدراسية الأخرى |                    |          |   |
| Prerequisite module               | CSC12105, CSC12006 | Semester | 2 |
| Co-requisites module              | None               | Semester |   |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Objectives</b><br>أهداف المادة الدراسية                                                                         | <p>By the end of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the fundamental principles, goals, and terminology of cryptography in the context of information security.</li> <li>2. Analyze classical and modern encryption algorithms to evaluate their design, strengths, and limitations.</li> <li>3. Apply appropriate cryptographic methods to secure data in various real-world scenarios.</li> <li>4. Implement encryption, decryption, and cryptanalysis algorithms using a high-level programming language.</li> <li>5. Evaluate cryptographic protocols for confidentiality, integrity, authentication, and non-repudiation</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | <ol style="list-style-type: none"> <li>1. Define key cryptographic concepts, goals, and terminology, including confidentiality, integrity, authentication, and non-repudiation.</li> <li>2. Demonstrate the use of mathematical foundations—such as modular arithmetic, prime factorization, and number theory—in cryptography.</li> <li>3. Implement classical ciphers (e.g., Caesar, Vigenère, Playfair) and modern encryption algorithms (e.g., DES, AES, RSA) using a programming language.</li> <li>4. Analyze the strengths and vulnerabilities of various symmetric and asymmetric encryption algorithms.</li> <li>5. Apply hashing and digital signature techniques to ensure message integrity and authenticity</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                                                                         | <p><b>Part A – Classical Cryptography</b></p> <p>In this part, the student will learn the fundamental principles of classical cryptography, which form the foundation of modern encryption systems. In earlier courses, the student may have encountered basic concepts of data confidentiality and integrity. In this part, the focus shifts to practical methods of securing information using classical encryption algorithms. Students will study substitution ciphers, such as the Caesar, Affine, Vigenère, Playfair, and Hill ciphers, as well as transposition ciphers, including the Rail Fence and Columnar Transposition. The concept of cryptanalysis—breaking classical ciphers—will also be covered, including techniques such as frequency analysis and brute force attacks.</p> <p><b>Part B – Modern Cryptography</b></p> <p>In this part, the student will learn the principles and applications of modern cryptography, which are essential for securing digital communication in real-world systems. The student will study symmetric-key algorithms such as DES, 3DES, and AES, including block cipher modes of operation. (The part also covers asymmetric-key algorithms (RSA, Diffie–Hellman, etc.). In addition, students will learn about hash functions and message authentication codes and digital signatures for ensuring integrity and authenticity.</p> |

| Learning and Teaching Strategies<br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strategies                                                      | <ol style="list-style-type: none"> <li>1. Lectures: Core cryptographic concepts, algorithms, and protocols will be introduced through interactive lectures supported by visual aids, diagrams, and real-world examples.</li> <li>2. Hands-on Laboratory Sessions: Students will implement encryption, decryption, and cryptanalysis techniques using programming languages.</li> <li>3. Problem-Solving Exercises: Practical challenges and cryptographic puzzles will be assigned to develop analytical and critical thinking skills.</li> <li>4. Group Discussions and Case Studies – Students will analyze case studies of cryptographic applications and failures to understand theoretical concepts.</li> <li>5. Project-Based Learning: A final project will require students to design and implement multiple cryptographic techniques learned in the course.</li> </ol> |

| Student Workload (SWL)<br>الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا       |                 |             |                                                                    |                |                           |
|-------------------------------------------------------------------------|-----------------|-------------|--------------------------------------------------------------------|----------------|---------------------------|
| Structured SWL (h/sem)<br>الحمل الدراسي المنتظم للطالب خلال الفصل       |                 | 64          | Structured SWL (h/w)<br>الحمل الدراسي المنتظم للطالب أسبوعيا       |                | 4                         |
| Unstructured SWL (h/sem)<br>الحمل الدراسي غير المنتظم للطالب خلال الفصل |                 | 61          | Unstructured SWL (h/w)<br>الحمل الدراسي غير المنتظم للطالب أسبوعيا |                | 4                         |
| Total SWL (h/sem)<br>الحمل الدراسي الكلي للطالب خلال الفصل              |                 | 125         |                                                                    |                |                           |
| Module Evaluation<br>تقييم المادة الدراسية                              |                 |             |                                                                    |                |                           |
|                                                                         |                 | Time/Number | Weight (Marks)                                                     | Week Due       | Relevant Learning Outcome |
| Formative assessment                                                    | Quizzes         | 2           | 15% (15)                                                           | 2, 7 ,10       |                           |
|                                                                         | Assignments     | 2           | 5% (5)                                                             | 2, 3, 4,5,14   |                           |
|                                                                         | Projects / Lab. | 1           | 15% (15)                                                           | Continuou<br>s |                           |
|                                                                         | Report          | 1           | 5% (5)                                                             | 11             |                           |
| Summative assessment                                                    | Midterm Exam    | 2hr         | 10% (10)                                                           | 7              |                           |
|                                                                         | Final Exam      | 3hr         | 50% (50)                                                           | 16             | All                       |
| Total assessment                                                        |                 |             | 100% (100 Marks)                                                   |                |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                       |
|-------------------------------------------------------------------|-------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                               |
| <b>Week 1</b>                                                     | Introduction to cryptography                          |
| <b>Week 2</b>                                                     | Basic Number Theory for Cryptography                  |
| <b>Week 3</b>                                                     | Monoalphabetic Substitution Ciphers and Cryptanalysis |
| <b>Week 4</b>                                                     | Polyalphabetic and polygraphic Substitution Ciphers   |
| <b>Week 5</b>                                                     | Transposition Ciphers                                 |
| <b>Week 6</b>                                                     | One-time pad and stream ciphers                       |
| <b>Week 7</b>                                                     | Mid-term Exam                                         |
| <b>Week 8</b>                                                     | Block Cipher Basics                                   |
| <b>Week 9</b>                                                     | Data Encryption Standard                              |
| <b>Week 10</b>                                                    | Advanced Encryption Standard                          |
| <b>Week 11</b>                                                    | Mode of operation                                     |
| <b>Week 12</b>                                                    | Asymmetric Cryptography: RSA                          |
| <b>Week 13</b>                                                    | Key Exchange: Diffie–Hellman                          |
| <b>Week 14</b>                                                    | Hash Functions and Message Authentication Codes       |
| <b>Week 15</b>                                                    | Digital signatures                                    |
| <b>Week 16</b>                                                    | Preparatory week before the final Exam                |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                            |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------|
|                                                                         | <b>Material Covered</b>                                                    |
| <b>Week 1</b>                                                           | Introduction to CrypTool                                                   |
| <b>Week 2</b>                                                           | Implement Caesar                                                           |
| <b>Week 3</b>                                                           | Perform frequency analysis on Caesar                                       |
| <b>Week 4</b>                                                           | Implement modular arithmetic, GCD, and modular inverse                     |
| <b>Week 5</b>                                                           | Implement Affine cipher                                                    |
| <b>Week 6</b>                                                           | Implement Vigenère cipher                                                  |
| <b>Week 7</b>                                                           | Midterm exam                                                               |
| <b>Week 8</b>                                                           | Implement Playfair                                                         |
| <b>Week 9</b>                                                           | Rail Fence cipher                                                          |
| <b>Week 10</b>                                                          | Implement Columnar Transposition                                           |
| <b>Week 11</b>                                                          | Encrypt/Decrypt with DES Using Cryptographic Library                       |
| <b>Week 12</b>                                                          | Implement AES in CBC, CFB, and CTR modes, and compare ciphertext patterns. |
| <b>Week 13</b>                                                          | Implement RSA                                                              |
| <b>Week 14</b>                                                          | Project Work                                                               |
| <b>Week 15</b>                                                          | Recap                                                                      |

| Learning and Teaching Resources                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                        |                     |          |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------|---------------------------------------|
| مصادر التعلم والتدريس                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                        |                     |          |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      | Text                                                                                                                                                                                                                                                                                                                                                                                                   |                     |          | Available in the Library?             |
| Required Texts                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                        |                     |          |                                       |
| Recommended Texts                                                                                                                                                                                                                                                                                                                                                                    | 1.D. Boneh and V. Shoup, <i>A Graduate Course in Applied Cryptography</i> , Version 0.6, 2020. [Online]. Available: <a href="https://crypto.stanford.edu/~dabo/cryptobook/">https://crypto.stanford.edu/~dabo/cryptobook/</a>                                                                                                                                                                          |                     |          |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      | 2.W. Stallings, <i>Cryptography and Network Security: Principles and Practice</i> , 8th ed., Pearson, 2016.                                                                                                                                                                                                                                                                                            |                     |          |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      | 3.Katz and Y. Lindell, <i>Introduction to Modern Cryptography</i> , 3rd ed., CRC Press, 2020.                                                                                                                                                                                                                                                                                                          |                     |          |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      | 4.C. Paar and J. Pelzl, <i>Understanding Cryptography: A Textbook for Students and Practitioners</i> , 2nd ed., Springer, 2019.                                                                                                                                                                                                                                                                        |                     |          |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                        |                     |          |                                       |
| Websites                                                                                                                                                                                                                                                                                                                                                                             | <a href="https://www.cryptool.org/en/">https://www.cryptool.org/en/</a><br><a href="https://cryptobook.nakov.com/">https://cryptobook.nakov.com/</a><br><a href="https://csrc.nist.gov/projects/cryptographic-standards-and-guidelines">https://csrc.nist.gov/projects/cryptographic-standards-and-guidelines</a><br><a href="http://practicalcryptography.com/">http://practicalcryptography.com/</a> |                     |          |                                       |
| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                        |                     |          |                                       |
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                        |                     |          |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                                                                                                                                                                                                                                                                                                                                                                                                  | التقدير             | Marks %  | Definition                            |
| Success Group (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 (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 Descriptor Form

## نموذج وصف المادة الدراسية

| Module Information          |                             |                               |                                                                                                                                                                                                                                                     |                               |
|-----------------------------|-----------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| معلومات المادة الدراسية     |                             |                               |                                                                                                                                                                                                                                                     |                               |
| Module Title                | Scientific Research         |                               | Module Delivery                                                                                                                                                                                                                                     |                               |
| Module Type                 | Basic                       |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input checked="" type="checkbox"/> Seminar |                               |
| Module Code                 | UOB309                      |                               |                                                                                                                                                                                                                                                     |                               |
| ECTS Credits                | 1                           |                               |                                                                                                                                                                                                                                                     |                               |
| SWL (hr/sem)                | 25                          |                               |                                                                                                                                                                                                                                                     |                               |
| Module Level                | Gx11 3                      | Semester of Delivery          |                                                                                                                                                                                                                                                     | 6                             |
| Administering Department    | CSC                         | College                       | COS                                                                                                                                                                                                                                                 |                               |
| Module Leader               | Dhuha Abdulhadi Abduljabbar |                               | e-mail                                                                                                                                                                                                                                              | dhuha.abd@sc.uobaghdad.edu.iq |
| Module Leader's Acad. Title | Lecturer                    | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                               |                               |
| Module Tutor                |                             |                               | e-mail                                                                                                                                                                                                                                              |                               |
| Peer Reviewer Name          |                             |                               | e-mail                                                                                                                                                                                                                                              |                               |
| Review Committee Approval   | 6/8/2025                    | Version Number                |                                                                                                                                                                                                                                                     |                               |

| 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>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                               | The course aims to teach students the key concepts of Research Methodology, and the main stages of the research process, including: how to define and formulate a research problem, literature review, various research methods, sampling, data source - explaining the primary & secondary methods of data collection, research preparation, and explaining the structure of research paper in detail.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | <p>At the end of this course, the students should be able to:</p> <ul style="list-style-type: none"> <li>• demonstrate knowledge of research processes and its basic concepts.</li> <li>• understand how to find and select an appropriate research problem, the sources of literature review collection and the key steps for writing it, similarities and differences between the two key categories of research approach (i.e. Quantitative and Qualitative Research Approaches), and an understanding the various methods for collecting data, as well as understanding the key steps for research preparation in details.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                                                                         | <p>Inductive content includes the following:</p> <ul style="list-style-type: none"> <li>- Research Methodology: review the fundamentals, the definition of the research, the objectives of research, motivation in research, general characteristics of research, and types of research [4 hr].</li> <li>- The Research Problem: what is a research problem, selecting the problem, sources of the problem, statement of a problem, and evaluation of a problem [4 hr].</li> <li>- The Review of Literature: meaning of review of literature, objectives of review of literature, sources of literature, and reporting the review of literature [4 hr].</li> <li>- The Research Approach: the Qualitative approach, the Quantitative approach, the Mixed-Methods approach, and criteria for selecting a research approach [4 hr].</li> <li>- Data Collection Methods: Questionnaires, interviews, focus Groups, and observation [4 hr].</li> <li>- Sampling: meaning and definition of sampling, functions of population and sampling, and methods of sampling [4 hr].</li> <li>- Preparation of the Research: characteristics of a good research title, structure of research paper, including: abstract, introductions, review of the literature, methodology, result &amp; discussions, conclusions, and references [6 hr].</li> </ul> |



## Learning and Teaching Strategies

### 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.</p> <p>This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب

|                                                                                |    |                                                                           |   |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 18 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 1 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 7  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا |   |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 75 |                                                                           |   |

## Module Evaluation

### تقييم المادة الدراسية

|                                 |                     | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning<br>Outcome |
|---------------------------------|---------------------|-----------------|------------------|------------|------------------------------|
| <b>Formative<br/>assessment</b> | <b>Quizzes</b>      | 3hr / 2         | 8% (8)           | 3 and 8    | LO #1                        |
|                                 | <b>Assignments</b>  | 4hr / 2         | 10% (10)         | 5 and 11   | LO #1                        |
|                                 | <b>Report</b>       | 10hr / 1        | 10% (10)         | 10         | All                          |
|                                 | <b>Presentation</b> | 7hr / 2         | 10% (10)         | 6 and 13   | All                          |
|                                 | <b>Field Visit</b>  | 1hr / 1         | 2% (2)           | Continuous |                              |
| <b>Summative<br/>assessment</b> | <b>Midterm Exam</b> | 8hr / 1         | 10% (10)         | 7          |                              |
|                                 | <b>Final Exam</b>   | 12hr / 1        | 50% (50)         | 16         |                              |
| <b>Total assessment</b>         |                     |                 | 100% (100 Marks) |            |                              |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المناهج الاسبوعي النظري |                                              |
|-------------------------------------------------------------------|----------------------------------------------|
|                                                                   | <b>Material Covered</b>                      |
| <b>Week 1</b>                                                     | Introduction to Research Methodology –Part 1 |
| <b>Week 2</b>                                                     | Introduction to Research Methodology –Part 2 |
| <b>Week 3</b>                                                     | The Research Problem –Part 1                 |
| <b>Week 4</b>                                                     | The Research Problem –Part 2                 |
| <b>Week 5</b>                                                     | The Review of Literature –Part1              |
| <b>Week 6</b>                                                     | The Review of Literature –Part2              |
| <b>Week 7</b>                                                     | The Research Approach –Part1                 |
| <b>Week 8</b>                                                     | The Research Approach –Part2                 |
| <b>Week 9</b>                                                     | Data Collection Methods –Part1               |
| <b>Week 10</b>                                                    | Data Collection Methods –Part2               |
| <b>Week 11</b>                                                    | Sampling –Part1                              |
| <b>Week 12</b>                                                    | Sampling –Part2                              |
| <b>Week 13</b>                                                    | Preparation of the Research – part 1         |
| <b>Week 14</b>                                                    | Preparation of the Research – part 2         |
| <b>Week 15</b>                                                    | Preparation of the Research – part 3         |
| <b>Week 16</b>                                                    | Preparatory week before the final exam       |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                 | <b>Text</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                           | <ol style="list-style-type: none"> <li>1. Mishra, S. B., &amp; Alok, S. (2022). Handbook of research methodology.</li> <li>2. Pandey, P., &amp; Pandey, M. M. (2021). <i>Research methodology tools and techniques</i>. Bridge Center.</li> <li>3. Tullu, M. S. (2019). Writing the title and abstract for a research paper: Being concise, precise, and meticulous is the key. <i>Saudi journal of anaesthesia</i>, 13(Suppl 1), S12.</li> <li>4. Bhardwaj, P. (2019). Types of sampling in research. <i>Journal of the Practice of Cardiovascular Sciences</i>, 5(3), 157.</li> </ol> | Available online                 |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                          | <p>5. Kumar, R. (2018). <i>Research methodology: A step-by-step guide for beginners</i>. Sage.</p> <p>6. Basias, N., &amp; Pollalis, Y. (2018). Quantitative and qualitative research in business &amp; technology: Justifying a suitable research methodology. <i>Review of Integrative Business and Economics Research</i>, 7, 91-105.</p> <p>7. Nallaperumal, K., &amp; Krishnan, A. (2013). Engineering Research Methodology: A Computer Science and Engineering and Information and Communication Technologies Perspective. <i>no. December</i>.</p> <p>8. Creswell, J. W. (2008). The selection of a research design. <i>Research Design-Qualitative, Quantitative, and Mixed Method Approaches-</i>, 3-22.</p> <p>9. Goddard, W., &amp; Melville, S. (2004). <i>Research methodology: An introduction</i>. Juta and Company Ltd.</p> <p>10. Kothari, C. R. (2004). <i>Research methodology: Methods and techniques</i>. New Age International.</p> |    |
| <b>Recommended Texts</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | No |
| <b>Websites</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |

#### APPENDIX:

| 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        | مقبول بقرار | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب        | (0-44)    | Considerable amount of work required  |
|                                     |                         |             |           |                                       |

#### Note:

NB 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.