# MODULE DESCRIPTION FORM

| Module Information | | | | | |
|---|---|---|---|---|---|
| **Module Title** | **Mathematics** | | | **Module Delivery** | |
| **Module Type** | **B** | | | ☒ **Theory**<br>☒ **Lecture**<br>☐ **Lab**<br>☒ **Tutorial**<br>☐ **Practical**<br>☐ **Seminar** | |
| **Module Code** | **AI1104** | | | | |
| **ECTS Credits** | **6** | | | | |
| **SWL (hr/sem)** | **150** | | | | |
| **Module Level** | 1 | | **Semester of Delivery** | 1 | |
| **Administering Department** | Artificial Intelligence | | **College** | Computer Science and Information Technology | |
| **Module Leader** | Elaf Ali Sfooq | | **e-mail** | elaf.ali@uowa.edu.iq | |
| **Module Leader's Acad. Title** | Assist Lecturer | | **Module Leader's Qualification** | M.Sc. | |
| **Module Tutor** | Elaf Ali Sfooq | | **e-mail** | elaf.ali@uowa.edu.iq | |
| **Peer Reviewer Name** | Mahmood jasim | | **e-mail** | mahmood.jasim@uowa.edu.iq | |
| **Scientific Committee Approval Date** | 01/11/2025 | | **Version Number** | 1.0 | |

| Relation with other Modules | | | |
|---|---|---|---|
| **Prerequisite module** | None | **Semester** | |
| **Co-requisites module** | None | **Semester** | |

**Department Head Approval** **Dean of the College Approval**

| Module Aims, Learning Outcomes and Indicative Contents | |
|---|---|
| **Module Objectives** | The aim of this module is to provide students with a solid foundation in core mathematical concepts and theories essential for further study in mathematics, science, and engineering. The course covers fundamental topics including algebra, calculus, geometry, discrete mathematics, probability, and statistics, equipping students with the analytical skills and problem-solving abilities required to apply mathematical principles effectively in academic and professional contexts. |
| **Module Learning Outcomes** | By the end of this module, students will be able to:<br>1. Understand and correctly use basic mathematical terminology and notation.<br>2. Apply formal mathematical definitions, theorems, and proofs to solve problems accurately.<br>3. Demonstrate a foundational understanding of propositional and predicate logic.<br>4. Explain the fundamental concepts of elementary set theory.<br>5. Understand and analyze mathematical relations and functions.<br>6. Understand the basic principles of graph theory and their applications. |
| **Indicative Contents** | • Calculus (Differentiation, Integration, and Applications)<br>• Linear Algebra (Matrices, Vectors, Systems of Linear Equations)<br>• Discrete Mathematics (Logic, Sets, Relations, Functions, Combinatorics)<br>• Probability and Statistics (Descriptive Statistics, Probability Theory, Distributions)<br>• Differential Equations (First-Order and Higher-Order Equations, Applications) |

| Learning and Teaching Strategies | |
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| **Strategies** | 1. **Lectures**<br>• Deliver core mathematical concepts, theories, and principles in a structured and systematic manner.<br>• Provide examples and step-by-step explanations to illustrate key ideas.<br>2. **Tutorials and Problem-Solving Sessions**<br>• Enable students to practice and apply mathematical techniques learned in lectures.<br>• Focus on exercises in algebra, calculus, discrete mathematics, probability, and statistics to reinforce understanding.<br>3. **Independent Learning and Self-Study**<br>• Students are encouraged to review lecture notes, textbooks, and online resources to consolidate learning.<br>• Assignments and practice exercises promote self-directed learning.<br>4. **Formative Assessments and Feedback**<br>• Quizzes, assignments, and in-class exercises provide regular feedback on student progress. |

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| | • Continuous assessment helps identify areas for improvement and supports mastery of mathematical concepts.<br>5. **Revision and Exam Preparation**<br>• Structured revision sessions and guided problem-solving prepare students for midterm and final exams.<br>• Emphasizes analytical reasoning, proof construction, and application of mathematical methods. |

| **Student Workload (SWL)** | | | |
|---|---|---|---|
| **Structured SWL (h/sem)** | 48 | **Structured SWL (h/w)** | 3 |
| **Unstructured SWL (h/sem)** | 102 | **Unstructured SWL (h/w)** | 6.8 |
| **Total SWL (h/sem)** | **150** | | |

| **Module Evaluation** | | | | | |
|---|---|---|---|---|---|
| | | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 5 | 15% (15) | 2,3,5,10,11 | LO #1, LO #3, LO #4 |
| | **Assignments** | 5 | 15% (15) | 2,4,6,9,12 | LO #2, LO #5, LO #6 |
| | **Projects / Lab.** | - | - | - | Not Applicable (N/A) |
| | **Report** | 1 | 10% (10) | 13 | LO #2, LO #6 |
| **Summative assessment** | **Midterm Exam** | 2hr | 10% (10) | 7 | (LO #1 – LO #4) |
| | **Final Exam** | 3hr | 50% (50) | 16 | All Learning Outcomes (LO #1 – LO #6) |
| **Total assessment** | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) | |
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| | **Material Covered** |
| **Week 1** | Functions: Function Definition, Domain and range of functions, Graphing of function |
| **Week 2** | Limits: Definition of limits, Theorems of limits, Type of limits |
| **Week 3** | The Definition and Interpretation of the Derivative |
| **Week 4** | Methods of proof and Mathematical induction |
| **Week 5** | Counting principles<br>Permutations and combinations |
| **Week 6** | Pigeonhole principle<br>Inclusion-exclusion principle |
| **Week 7** | Midterm |
| **Week 8** | Number Theory:<br>● Prime numbers and factorization<br>● Modular arithmetic<br>● GCD and LCM<br>● Applications in cryptography |
| **Week 9** | Probability and Statistics:<br>● Probability spaces<br>● Random variables and distributions<br>● Expectation and variance<br>● Applications in data analysis and algorithm analysis |
| **Week 10** | Linear Algebra for Computer Science:<br>● Vectors and matrices |
| **Week 11** | ● Linear transformations |
| **Week 12** | ● Eigenvalues and eigenvectors<br>● Applications in Machine Learning |
| **Week 13** | Special Topics:<br>● Cryptography |
| **Week 14** | ● Computation theory and Complexity theory |
| **Week 15** | Recap for the final exam |

| Learning and Teaching Resources | | |
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| | **Text** | **Available in the Library?** |
| **Required Texts** | Calculus, Thomas ,1990,5th edition | Yes |
| **Recommended Texts** | Howard Anton, Irl Bivens, Stephen Davis, CALCULUS, 10th Edition, John Wiley & Sons, Inc., 2012. | No |
| **Websites** | https://ocw.mit.edu/ , https://tutorial.math.lamar.edu/ | |

| Grading Scheme | | | | |
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| **Group** | **Grade** | Mark | **Marks %** | **Definition** |
| **Success Group (50 - 100)** | **A -** Excellent | Excellent | 90 - 100 | Outstanding Performance |
| | **B -** Very Good | Very Good | 80 - 89 | Above average with some errors |
| | **C -** Good | Good | 70 - 79 | Sound work with notable errors |
| | **D -** Satisfactory | Fair / Average | 60 - 69 | Fair but with major shortcomings |
| | **E -** Sufficient | Pass / Acceptable | 50 - 59 | Work meets minimum criteria |
| **Fail Group (0 – 49)** | **FX –** Fail | Fail (Pending) | (45-49) | More work required but credit awarded |
| | **F –** Fail | Fail | (0-44) | Considerable amount of work required |
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**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.