

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information						
معلومات المادة الدراسية						
Module Title	Computer Science II		Module Delivery			
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar			
Module Code	UOB203					
ECTS Credits	3					
SWL (hr/sem)	75					
Module Level		2	Semester of Delivery		3	
Administering Department		Petroleum Engineering	College	College of Engineering		
Module Leader		Abbas Abdulaali		e-mail	ab.jasim23@gmail.com	
Module Leader's Acad. Title		Assistant Lecturer		Module Leader's Qualification		M.Sc.
Module Tutor		Abbas Abdulaali		e-mail	ab.jasim23@gmail.com	
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Scientific Committee Approval Date		2025/10/5		Version Number		1.0

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



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

Module Objectives أهداف المادة الدراسية	Introduction to MATLAB as a high-level programming and computational environment used in engineering analysis and design, the fundamental programming concepts such as variables, arrays, loops, conditional statements, and functions, numerical methods, data visualization, and algorithmic thinking using MATLAB tools, mathematical modeling, curve fitting, interpolation, integration, and plotting, Computation and simulation.		
Module Learning Outcomes	Knowledge	A1	A1.1 Define and identify MATLAB environment components and fundamental operations. A1.2 Describe and explain MATLAB syntax and programming structure. A1.3 Apply MATLAB functions and commands to solve mathematical and engineering problems. A1.4 Analyze and compare MATLAB approaches for data visualization and performance.
		A4	A4.1 Interpret problem requirements and classify data elements for MATLAB program design. A4.2 Apply MATLAB algorithms to simulate and solve engineering processes. A4.3 Design and develop complete MATLAB scripts integrating multiple functions and visualization techniques. A4.4 Evaluate and optimize MATLAB solutions to enhance accuracy and efficiency.
	Skills	B1	B1.1 Function efficiently as an individual to develop and test MATLAB programs that solve engineering problems. B1.2 Function as a member of a multidisciplinary technical team to design, implement, and document MATLAB-based projects.
		B2	B2.1 Communicate effectively through written reports and oral presentations describing MATLAB analysis and results. B2.2 Communicate graphically using MATLAB visualization tools to represent data and algorithmic results.
	Ethics	C1	C1.1 Define professional and ethical responsibilities related to data usage, coding integrity, and teamwork in MATLAB projects. C1.2 Demonstrate ethical commitment and respect for intellectual property, accuracy, and collaboration in all MATLAB practices.

abblndicative Contents

المحتويات الإرشادية

Part A – Introduction to MATLAB Environment

- Overview of MATLAB as a numerical computing environment and programming language.
- Structure of MATLAB interface: Command Window, Editor, Workspace, and Figure Window.
- Basic MATLAB operations and syntax.
- Creating and managing variables.
- Input and output commands.
- Using MATLAB as a calculator.
- Handling errors and correcting commands.

Part B – Mathematical and Logical Operations

- Arithmetic, relational, and logical operators.
- Mathematical functions (trigonometric, exponential, logarithmic).
- Operator precedence and order of execution.
- Working with complex numbers.
- Examples and problem-solving exercises.

Part C – Arrays and Matrices

- Creation of arrays and matrices.
- Matrix indexing and slicing.
- Matrix generation functions and special matrices.
- Matrix arithmetic operations.
- Array operations and element-wise calculations.
- Solving linear equations using MATLAB.
- Transposition, concatenation, and reshaping.
- Matrix inverse and determinant calculations.

Part D – Control Flow and Programming Logic

- Control structures: if-else, switch-case.
- Loop structures: for, while.
- Relational and logical expressions.
- Nested control statements.
- Flow control commands (break, continue).
- Debugging and managing program flow.

Part E – Functions and Script Files

- Difference between scripts and functions.
- Writing and saving MATLAB functions.
- Input and output arguments.
- Scope of variables and function handles.
- Managing files and paths.
- Examples of reusable functions for engineering problems.

Part F – Polynomials, Curve Fitting, and Interpolation

- Representing polynomials using vectors.
- Evaluating, differentiating, and integrating polynomials.
- Polynomial roots and graphical visualization.
- Curve fitting techniques using polyfit and polyval.
- Interpolation methods (interp1, spline).
- Practical exercises on experimental data fitting.

Part G – Numerical Methods and Integration

- Numerical differentiation and integration.
- Trapezoidal and Simpson's rule.

	• Solving simple numerical problems using MATLAB functions. • Applications in engineering computations. Part H – Data Visualization and Plotting • Introduction to MATLAB graphics system. • Creating 2D plots (plot, subplot, hold on/off). • Customizing plots: titles, labels, legends, colors, line styles. • Creating 3D plots (mesh, surf, contour). • Adding annotations and exporting figures. • Visualization of multiple data sets. Part I – File Handling and Data Management • Reading and writing files using fopen, fscanf, and fprintf. • Importing data from Excel and text files. • Saving and loading .mat files. • Working with structured data and tables. Part J – Project and Application Development • Integrating MATLAB components into a small-scale engineering project. • Designing algorithms to solve practical computational problems. • Optimization and performance considerations. • Preparing reports and visual outputs. • Final presentation and evaluation of project outcomes.
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The strategies include: • Lectures: ○ Two hours per week to present the theoretical concepts of MATLAB programming and its engineering applications. ○ Emphasis on explaining syntax, logic structures, and mathematical functions. ○ Demonstrations of problem-solving techniques using MATLAB live examples. • Laboratory Sessions: ○ Two hours per week devoted to practical implementation and exercises. ○ Students work directly on MATLAB software to apply concepts learned in lectures. ○ Laboratory activities include writing scripts, debugging code, creating plots, and solving real-world engineering problems. • Interactive Discussions and Problem Solving: ○ Encouraging students to analyze programming errors and collectively find solutions. ○ Open discussions on computational logic and efficiency. • Assignments and Mini-Projects: ○ Individual and group assignments designed to integrate theoretical knowledge with practical experience.

	○ A final mini-project requiring students to design, implement, and test a MATLAB program addressing an engineering scenario. • Self-Study and Reading: ○ Students are encouraged to explore MATLAB documentation and online tutorials to reinforce learning. ○ Independent exploration of new MATLAB features and toolboxes beyond class coverage. • Assessment Methods: ○ Continuous assessments including quizzes, lab work, and assignments to monitor progress. ○ Midterm and final exams to evaluate overall understanding and application skills. ○ Oral and written feedback provided to enhance student learning outcomes.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	A1
	Assignments	2	10% (10)	2 and 12	A1,A4,B1
	Projects / Lab.	1	10% (10)	Continuous	A4, B1, B2, C1

	Report	1	10% (10)	13	B2, C1
Summative assessment	Midterm Exam	2hr	10% (10)	7	A1, A4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري		
	Material Covered	Los
Week 1,2	Introduction to MATLAB environment, variables, input/output operations.	A1
Week 3	Mathematical functions and operators.	A1
Week 4,5	Arrays and matrix operations	A1
Week 6	Control flow: if, for, while structures.	A1,A4
Week 7	Functions and scripts.	A4
Week 8	Polynomial operations, curve fitting, and interpolation.	A4
Week 9	Numerical integration techniques.	A4, B2
Week 10	Data visualization and 2D plotting.	A4, B2
Week 11	3D plotting and advanced graphics.	A4, C1
Week 12	File I/O and data import/export.	A4, C1
Week 13	Debugging and error handling.	A4, C1
Week 14	Mini-project development.	A4, B1, B2, C1
Week 15	Course review and final project presentation.	A4, B1, B2, C1

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر		
	Material Covered	Los
Week 1	Getting started with MATLAB interface and basic commands.	A1
Week 2	Variables and arrays practice.	A1
Week 3	Matrix operations and indexing.	A1
Week 4	Conditional statements and loops.	A1

Week 5	Writing and testing MATLAB functions.	A1,A4
Week 6	Polynomial evaluation and differentiation.	A4
Week 7	Curve fitting and interpolation.	A4
Week 8	Numerical integration exercises.	A4,B2
Week 9	2D and 3D plotting.	A4, C1
Week 10	File handling and importing data.	A4, C1
Week 11	Debugging practice.	A4, B1
Week 12	Project preparation.	A4, B1, B2
Week 13	Mini-project implementation.	A4, B1, B2, C1
Week 14	Testing and optimization.	A4, B1, B2, C1
Week 15	Final project presentation.	A4, B1, B2, C1

Learning and Teaching Resources مصادر التعلم والتدريس		
Text		Available in the Library?
Required Texts	D. Houcque, "Introduction to MATLAB for Engineering Students," Northwestern University, 2005.	Yes
Recommended Texts		
Websites	https://eng.alayen.edu.iq//colleges/e/42	

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	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded

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

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