

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Computational engineering methods		Module Delivery	
Module Type	Support or related learning activity		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	MDER320			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	3	Semester of Delivery		6
Administering Department	Biomedical engineering		College	College of Engineering
Module Leader	Ali akbar wathiq		e-mail	Aliakbar@gmail.com
Module Leader's Acad. Title			Module Leader's Qualification	Msc
Module Tutor	Ali akbar wathiq		e-mail	Aliakbar@gmail.com
Peer Reviewer Name	-		e-mail	
Scientific Committee Approval Date			Version Number	1.0

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



Module Aims, Learning Outcomes and Indicative Contents		
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية		
Module Aims أهداف المادة الدراسية	1. Develop understanding of numerical methods. 2. Enhance problem-solving skills. 3. Improve computational and programming abilities. 4. Foster critical thinking and analysis. 5. Apply numerical techniques to real-world problems.	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Knowledge	A2 A2.1 Define the fundamental concepts of numerical analysis, including nonlinear equations, interpolation, numerical integration, and numerical differentiation. A2.2 Explain the principles and procedures of numerical methods such as Bisection, False Position, Newton–Raphson, Secant, Fixed-Point Iteration, interpolation techniques, and numerical differentiation and integration. A2.3 Apply numerical methods to compute approximate solutions of nonlinear equations and to perform interpolation, numerical differentiation, and numerical integration using analytical and computational techniques.
		A4 A4-1 Recognize the basic MATLAB functions and commands used in implementing numerical methods for solving engineering problems. A4-2 Discuss the results obtained from MATLAB simulations of numerical methods, including graphs, tables, and error outputs. A4-3 Implement numerical methods using MATLAB to solve nonlinear equations and perform interpolation, numerical differentiation, and numerical integration.
	Skills	B1 B1.1 Communicate effectively B1.2 Students will have developed problem solving and reasoning abilities that will serve them well in many important petroleum engineering aspects as well as their lives.
		B2 B2.1 Communicate effectively – graphically with a range of audiences using contemporary tools. B2.2 Communicate verbally and in writing with a range of audiences using contemporary tools.
	Ethics	C2 C2.1 Recognize professional and ethical responsibility. C2.2 Adhere and respect diversity.
	1.	
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Basics of Numerical Analysis .[2 hrs]	

	• Numerical Methods for Solving Systems of Nonlinear Equations. [16 hrs] ○ The Bisection Method. ○ False Position Method. ○ Newton's methods. ○ Secant Methods. ○ Simple Fixed-Point Iteration Methods. • Interpolation and Polynomial Approximation. [4 hrs] • Numerical Integration & Differentiation. [4 hrs] • Exames .[4 hrs] • Laboratory [30 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	1.58
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	2.7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		



Module Evaluation						
تقييم المادة الدراسية						
			Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Theory	Quizzes	1	10% (10)	Continuous	A2
		Onsite assignments	1	5% (5)	Continuous	A2-2
		Homework	1	5% (5)	Continuous	A4-1
		Report	1	5% (5)	Continuous	A2 A4
	Lab		1	15% (15)	Continuous	A4
Summative assessment	Midterm Exam		1	10% (10)	5,9	A2 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	Introduction - Basics of Numerical Analysis	A2-1, B1.1, C1-1
Week 2	Numerical Methods for Solving Systems of Nonlinear Equations /The Bisection Method	A2-2, B2.1, C1-3
Week 3	Numerical Methods for Solving Systems of Nonlinear Equations / False Position Method	A2-1, A4-2, C1-1
Week 4	Numerical Methods for Solving Systems of Nonlinear Equations / Newton's methods	A2-1, A4-1
Week 5	Numerical Methods for Solving Systems of Nonlinear Equations / Secant Methods	A2-1, A2-3, A2-2, B2.2
Week 6	Numerical Methods for Solving Systems of Nonlinear Equations / Simple Fixed-Point Iteration Methods	A2-1, A2-3, A2-2, B2.2
Week 7	1 st mid exam	A2
Week 8	Interpolation and Polynomial Approximation	A2-1, A4-3, A3-2
Week 9	Interpolation and Polynomial Approximation	A2-2, B2.2, C1-3
Week 10	Numerical Integration	A2-2, B2.1, C1-1



Week 11	Numerical Integration	A2-1, A4-3, A4-2, B1.2,
Week 12	Numerical Differentiation	A2-2, A4-2, B1.1
Week 13	Numerical Differentiation	A2-2, A3-2, B1.1
Week 14	2 nd mid exam	A2-1 A2-2, A3-2, B1.1
Week 15	Preparatory week before the final Exam	A2

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered	LOs
Week 1	Lab 1: INTRODUCTION TO MATLAB	A4
Week 2	Lab 2: ROOT FINDING METHODS USING BISECTION METHOD WITH MATLAB	A4
Week 3	Lab 3: ROOT FINDING METHODS USING FALSE POSITION METHOD WITH MATLAB	A4
Week 4	Lab 4: ROOT FINDING METHODS USING BISECTION METHOD WITH EXCEL	A4
Week 5	Lab 5: ROOT FINDING METHODS USING FALSE POSITION METHOD WITH EXCEL	A4
Week 6	Lab 6: ROOT FINDING METHODS USING NEWTON-RAPHSON METHOD WITH MATLAB	A4
Week 7	Lab 7: ROOT FINDING METHODS USING SECANT METHOD WITH MATLAB	A4
Week 8	Lab 8: ROOT FINDING METHODS USING NEWTON-RAPHSON METHOD WITH EXCEL	A4
Week 9	Lab 9: ROOT FINDING METHODS USING SECANT METHOD WITH EXCEL	A4



Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Lectures	Yes
Recommended Texts	- Numerical Analysis, Richard L. Burden. - An Introduction to Numerical Analysis, Atkinson.	No
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 (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

