



Ministry of Higher Education and
Scientific Research - Iraq
University of Diyala
College of Engineering
Department of Materials Engineering



MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	ENGINEERING NUMERICAL METHODS		Module Delivery
Module Type	BASIC		Theory Lecture Tutorial
Module Code	MAE323		
ECTS Credits	3		
SWL (hr/sem)	45		
Module Level	1	Semester (s) offered	
Administering Department		College	Engineering
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Review Committee Approval		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, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	This module aims to provide students with an understanding of, and competence in the use of, engineering numerical methods that are relevant to the solution of engineering problems. It will also give students a firm foundation from which to develop solutions to a wider and deeper range of engineering problems that they will encounter throughout their undergraduate engineering program of study.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> 1. Enable the student to solve a system of algebraic equations using numerical methods in materials engineering. 2. Enable the student to manually solve a system of linear and nonlinear equations using numerical methods. 3. Urging the student to solve differential equations individually or as a system of equations and in different ways, compare their results, and determine how to reduce errors. 4. Enable the student to solve a system of curve fitting and interpolation. 5. Numerical integration and differentiation, solution of ordinary and partial differential equations. 6. Applications of derivatives: Apply the techniques of differentiation to solve problems involving rates of change, linearization, curve sketching, mean value theorem and Initial value problem. 7. Complex numbers: Demonstrate an understanding of complex numbers with basic operations and their mathematical and graphical representations including Euler's Formula 		
Indicative Contents المحتويات الإرشادية	<p>The topics listed under the indicative content below are the underpinning areas of knowledge and understanding that will be obtained from successful completion of the module. The mathematical topics are illustrated in the context of relevant engineering scenarios.</p> <ul style="list-style-type: none"> • Error analysis. • Roots of nonlinear algebraic equations, solution of linear and transcendental simultaneous equations. • Numerical integration and differentiation, solution of ordinary and partial differential equations. • Ordinary differential equations • Matrix and vector manipulation, curve fitting and interpolation. 		

Course Description	This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Begin In Engineering analysis, then employ a range of teaching strategies to ensure third-year engineering students fully grasp the various mathematical concepts. Instructional methods include interactive lectures, where core mathematical principles are explained in detail, and practical problem-solving sessions to provide hands-on learning experiences. Collaborative group work encourages peer-to-peer learning and reinforces understanding through shared insights. Regular formative assessments will be conducted to monitor students' understanding of the material, and feedback will be promptly given to guide their learning process. Instructors will maintain office hours for personalized support, and online resources will be available to supplement classroom instruction. Emphasis will be placed on relating mathematical concepts to real-world engineering applications to make the learning experience more relevant and engaging. These strategies aim to develop students' critical thinking skills, enhance their problem-solving abilities, and prepare them for advanced engineering studies.

Module Evaluation تقييم المادة الدراسية					
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3,5, 10, 12, 14	LO #1, 2, 3, 4 ,5 and 7
	Assignments	6	20% (20)	4, 8, 12	LO # 1, 2, 3, 4, 5 and 6
Summative assessment	Midterm Exam	2	20% (20)	7	LO # 1,4
	Final Exam	3	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Error analysis
Week 2	Roots of nonlinear algebraic equations, solution of linear and transcendental simultaneous equations

Week 3	Roots of nonlinear algebraic equations, solution of linear and transcendental simultaneous equations
Week 4	Matrix and vector manipulation
Week 5	Matrix and vector manipulation
Week 6	Curve fitting (Linear Model)
Week 7	Curve fitting (Multiple Linear Regression)
Week 8	Polynomial Interpolation
Week 9	Newton's Divided Difference Method of Interpolation Linear
Week 10	Numerical integration
Week 11	Trapezoidal Rule of Integration
Week 12	Numerical differentiation
Week 13	Numerical differentiation
Week 14	Solution of ordinary and partial differential equations
Week 15	Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	A_Textbook_of_Engineering_Mathematics_(Volume_I) Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, (2010).	Yes
Recommended Texts	Mathews, J.H., 1992. Numerical methods for mathematics, science and engineering (Vol. 10). Prentice- Hall International.	Yes
Websites		

APPENDIX:

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	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.