MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Numerical Methods**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CRNUMMET**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Computer Science		**College**	College of Sciences	
Module Leader	Dr. Abdulkareem Merhej Radhi		**e-mail**	Abdulkarem.merhej@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Prof.		**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	01/06/2023		**Version Number**	1.0	
Laboratory Techers	عبد الكريم مرهج راضي+ عبير خالد أحمد + محمود ثامر عامر +شيماء عبد الستار + حنين حقي				

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. This course aims to introduce the fundamentals of applied numerical analysis methods, which serve as the mathematical foundation for other scientific subjects such as information security, databases, data structures, and data encryption. 2. It will familiarize students with the most important methods and algorithms for obtaining approximate solutions to linear and nonlinear algebraic equations using iterative methods. 3. It will demonstrate how to apply numerical analysis methods to solve real-world, practical problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. How to represent numbers using fixed and floating-point representations, as well as binary and decimal representations. 2. How to use optimal algorithms for number finding. 3. How to represent linear and nonlinear equations. 4. Developing the skill to solve linear and nonlinear equations. 5. Understanding the practical applications of numerical analysis in finding practical solutions. 6. How to utilize computers to obtain approximate and accurate solutions using numerical analysis.
Indicative Contents المحتويات الإرشادية	Learn how to use computers to find practical and accurate solutions to numerical problems. Compare the algorithms and methods used to solve mathematical equations. How to apply numerical analysis algorithms to solve practical problems.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy to be adopted in delivering this unit is to explain lectures interactively by involving students in solving mathematical problems and using the laboratory for the practical application of theoretical material. Brainstorming, electronic tools, and visual aids will be used to deliver the material to students in an interactive manner.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	2,5,8,12	All
	Assignments	2	5% (5)	5,10	All
	Projects / Lab.	1	15% (15)	Continuous	All
	Report	1	10% (10)	10	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7,14	All
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Numerical Analysis Methods Accuracy of Mathematical Results Error Analysis Difference Between Approximate and Accurate Solutions
Week 2	Solving linear and nonlinear equations Using the section classification method in research Using the Newton-Raphson method

Week 3	Using the fixed point route
Week 4	What are linear equations and their importance? Methods for solving linear equations: Jacobi's method
Week 5	Gaussian algorithm Causes'-Seidel algorithm
Week 6	Euler's algorithm
Week 7	Improved Euler algorithm
Week 8	Newton's algorithm for solving and finding equivalent equations
Week 9	Newton's forward difference and division algorithm
Week 10	Newton's inverse solution algorithm
Week 11	Comparison between Newton's two algorithms in finding solutions
Week 12	Using numerical analysis methods in full: Simpson's method Trapezoidal method
Week 12	Introduction to Matrices
Week 13	Using and representing matrices in solving mathematical equations
Week 14	Second semester midterm exam
Week 15	Mid-term Exam 2
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Accuracy of Mathematical Results Error Analysis, Difference Between Approximate and Exact Solutions
Week 2	Lab 2: Solving Linear and Nonlinear Equations: Using the Intersection Classification Method in Research, Using the Newton-Raphson Method
Week 3	Lab 3: Using the Fixed-Point Method
Week 4	Lab 4: What are Linear Equations and Their Importance
Week 5	Lab 5: Gaussian Algorithm & Caussian Seidel Algorithm
Week 6	Lab 6: Euler's Algorithm
Week 7	Lab 7: Improved Euler's Algorithm
Week 8	Lab 8: Newton's Algorithm for solving
Week 9	Lab 9:Forward Newton Divided & subtraction Algorithm.
Week 10	Lab 11:Inverse solution algorithm

Week 11	Lab 11:Comparison between Newton algorithms
Week 12	Lab 12: Using Numerical Analysis Methods in Integration, Simpson and Trapezoidal Rules
Week 13	Lab 13: Introduction to Matrices'
Week 14	Lab 14: Using Matrices to solve equations
Week 15	Second Mid Term Examination

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Computer System Architecture, 3rd edition, by M. Morris Mano	No
Recommended Texts		No
Recommended Texts		No

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.