	Ministry of Higher Education and Scientific Research - Iraq University of Technology Department of Computer Science Information System Branch	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**NUMERICAL ANALYSIS**	**Module Delivery**	
Module Type	BASIC	**-Theory Lecture** **-Lab** **-PracticalSeminar**	
Module Code	**NUAN213**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		
Module Level	2	**Semester of Delivery**	3
Administering Department	Department of Computer Sciences	**College**	Computer Sciences
Module Leader	Assist.lec. manar musab	**e-mail**	Manar.m.alani@uotechnology.edu.iq
Module Leader's Acad. Title	**Assist. lec.**	**Module Leader's Qualification**	**M.SC.**
Module Tutor	None	**e-mail**	None
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	**MATH112**	**Semester**	1
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. Explain and apply various numerical methods for mathematical problem-solving. 2. Implement numerical algorithms using MATLAB for solving mathematical problems. 3. Analyze and quantify errors associated with numerical methods. 4. Apply numerical techniques to solve real-world engineering and scientific problems. 5. Communicate results effectively, both orally and in writing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand and explain fundamental numerical methods. 2. Implement numerical algorithms using MATLAB. 3. Analyze and control errors in numerical computations. 4. Apply numerical techniques to solve engineering and scientific problems. 5. Communicate results of numerical analyses clearly and effectively.
Indicative Contents المحتويات الإرشادية	1- Introduction to Numerical Methods 2- Error Analysis and Computer Arithmetic 3- Solutions of Equations in One Variable 4- Interpolation and Polynomial Approximation 5- Numerical Differentiation and Integration 6- Numerical Solution of Initial Value Problems for Ordinary Differential Equations 7- Direct Methods for Solving Linear Systems 8- Iterative Techniques in Matrix Algebra 9- Approximation Theory and Least Squares Approximation 10- Approximation of Eigenvalues and Eigenvectors 11- Numerical Solution of Boundary Value Problems for Ordinary Differential Equations 12- Finite Difference Methods for Boundary Value Problems 13- Numerical Solution of Partial Differential Equations 14- Introduction to MATLAB for Numerical Analysis 15- These contents typically cover a wide range of numerical methods and algorithms commonly used in mathematical and computational applications.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning outcomes for a Numerical Analysis course include: 1. Understanding and implementing numerical methods for solving mathematical problems, such as root finding, interpolation, and approximation of functions. 2. Analyzing the properties of numerical algorithms including convergence, stability, and accuracy. 3. Applying numerical techniques to solve practical engineering and scientific problems, such as differential equations, optimization, and linear algebraic equations. 4. Developing proficiency in programming and utilizing computational tools like MATLAB, Python, or numerical computation software to implement algorithms and analyze numerical solutions.

	5. Critically evaluating the results obtained from numerical methods, including error analysis and comparing with analytical solutions where possible. 6. Exploring advanced topics in numerical analysis, such as finite element methods, numerical integration, and solving eigenvalue problems.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.7
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**	1	10% (10)	5	LO # 1 and 3
	Practical Seminar(Lab).	2	15% (15)	Continuous	LO # 2 , 4 and 5
Summative assessment	**Midterm Exam**	1 hr	15% (15)	14	LO # 1 to 5
	Final Exam	3hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to numerical analysis+ Solution of non-linear equations, Newton Raphson method for approximating, Lagrange approximation**
Week 2	**Numerical differentiation and numerical integration, The Solutions of Integral equations, Trapezoidal method Simpsons method**
Week 3	**Simpsons method(3/8)**
Week 4	**numarical differentiation, Euler method, modified Euler method**
Week 5	**Rung Kutta method, Rung Kutta-merson method**
Week 6	**Introduction and soiution of Partial differential equations**

Week 7	Formation of Partial differential equations And solution of separable first order
Week 8	Types of partial differential equations,wave equation,heat equation
Week 9	Solution sys of linear equation, Elimination and iterative methods
Week 10	Solution sys of linear eq by Cramer's rule, solve by inverse matri
Week 11	Method of least square
Week 12	introduction to Fourier series
Week 13	Fourier series for odd and even functions, Half range Fourier series
Week 14	Change of interval Fourier series
Week 15	Mid Term Exam and Preparatory Week
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Delivery Plan (Weekly Lab. Syllabus)	**Material Covered**
Week 1	Introduction to MATLAB for numerical computations
Week 2	Solving linear systems of equations iin matlab
Week 3	Interpolation and curve fitting
Week 4	Numerical differentiation and integration
Week 5	Solution of nonlinear equations
Week 6	Numerical solutions of ordinary differential equations (ODEs)
Week 7	Finite difference methods
Week 8	Numerical solutions of partial differential equations (PDEs)
Week 9	Optimization techniques Error Analysis in Numerical Computations
Week 10	MATLAB programming for numerical analysis
Week 11	Simple introduction about using matlab program
Week 12	Vectors in matlab prog.
Week 13	Matrix in matlab prog.
Week 14	Application of numerical analysis in matlab
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**1. Thomas,G. Calculus and Analytic Geometry,Fifth Edition,Addition Wesly,1999**	No
Recommended Texts	**1. matlab programming language.**	No
Websites	**Any sources take in lectures and examples**	

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.