

Course Description Form

1. Course Name:	
Numerical analysis	
2. Course Code:	
220CsMm	
3. Semester / Year:	
Year	
4. Description Preparation Date:	
19-9-2025	
5. Available Attendance Forms:	
Daily course - (lectures + laboratory)	
6. Number of Credit Hours (Total) / Number of Units (Total)	
90 hours. (1 theoretical - 2 practical) weekly	
7. Course administrator's name (mention all, if more than one name)	
Prof. Dr. Areej Tawfeeq Hameed areej.t@ihcoedu.uobaghdad.edu.iq	
Dr. Suhad Ahmed Ahmed Suhad.a.a@ihcoedu.uobaghdad.edu.iq	
8. Course Objectives	
Course Objectives	Key issues in Numerical analysis include acquisition of valid source information about the relevant selection of key characteristics and behaviours, the use of simplifying approximations and assumptions within the Numerical analysis
Cognitive objectives	
	<p>A1- The student should be familiar with the security of computers and data</p> <p>A2- That the student becomes familiar with the characteristics and advantages of information security</p> <p>A3- To become familiar with the most important methods used for protection</p> <p>A4- To learn about the types of data-related crimes and the types of hacking methods</p>

	<p>A5- To learn about the types of encryption methods used to protect data</p> <p>A6- To apply the algorithms used to encrypt and protect data</p> <p>A7- Preparing qualified cadres to teach computer subjects in all educational institutions.</p>
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Skills objectives for the course	
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	<p>B1 - Performance skills by involving students in the lesson, discussion, and presenting their suggestions and opinions.</p> <p>B2 - Cognitive skills through creating a worksheet related to their study requirements in which they rely on books in the college library and reliable websites.</p> <p>B3 - Self-evaluation processes for students and determining their levels through discussion and attendance</p> <p>B4- Practical skills through the practical application of methods and algorithms related to data and network protection.</p> <p>B5- The student acquires the skill of teaching in the sciences related to information security and network protection</p>
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Emotional and value goals	
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	<p>C1- Assigning students to scientific reports to develop the applied aspect</p> <p>C2- Social skills by opening a social dialogue between students</p> <p>A3- Involving students in seminars held by the department in cooperation with the Continuing Education Unit and the Cultural Unit in order to enable students to achieve self-realization and increase self-confidence.</p>
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	<p>C4- Assigning students to reports related to the practical aspect related to programs related to protection methods</p> <p>C5- The student analyzes the software problems in transferring data using various secure methods</p>
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9. Teaching and Learning Strategies

Strategy	<p>Introduction to Numerical analysis, Representation of numbers, Error analysis, Errors in arithmetic operations, Relative error , Absolute error, Percentage Error, Matrices, Matrices properties , Matrices invers, Cofactor Method for Invers and Transpose, Operation on Matrices, Systems of Linear Equations, Numerical Solutions for Systems of Linear Equations, Gauss elimination , Gauss Jordan elimination , Cramer’s rule.</p> <p>Numerical Solutions for non-Linear Equations, Graphical Method, Bisection Method, Secant Method, Newton’s method, Extrapolation and interpolation, Finite differences operators, Forward differences, Backward differences, Newton’s Formulae for Interpolation, Lagrange’s Interpolation Formula, Numerical integration, Simpson’s Formula, Trapezoidal Formula, Mid-point Formula.</p>
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10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	1 theoretical, 2 practical	Introduction to Numerical Analysis	Introduction to Matlab	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
2	1 theoretical, 2 practical	Errors in Arithmetic Operations - Relative Error - Absolute Error Percentage Error	Using loop and condition statements in Matlab	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
3	1 theoretical, 2 practical	- Introduction to numerical solutions of nonlinear equations	Application software in Matlab	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports

		- Method for determining root locations -			
4	1 theoretical, 2 practical	Method of Bisection Method	Program for applying the period halving method	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
5	1 theoretical, 2 practical	False position method	Program for applying the false position method	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
6	1 theoretical, 2 practical	Secant Method	Program for applying the Secant Method	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
7	1 theoretical, 2 practical	Newton-Raphson method	Program for applying the Newton-Raphson method	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
8	1 theoretical, 2 practical	Matrices	Matrices in Matlab	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
9	1 theoretical, 2 practical	Matrices Properties Matrices Operations	Matrices Properties Matrices Operations	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
10	1 theoretical, 2 practical	Solve equations using linear iterative methods	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
11	1 theoretical, 2 practical	Gauss method	Application software	Presentation + direct meeting in the hall and use of the	Monthly exams + laboratory reports

				blackboard + laboratory	
12	1 theoretical, 2 practical	Gauss method with Partial pivoting	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
13	1 theoretical, 2 practical	Gauss – Jordan method	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
14	1 theoretical, 2 practical	Gauss – Jordan method with Partial pivoting	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
15	1 theoretical, 2 practical	Interpolation and Extrapolation	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
16	1 theoretical, 2 practical	Lagrange polynomial	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
17	1 theoretical, 2 practical	Finite differences	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
18	1 theoretical, 2 practical	Forward differences	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
19	1 theoretical, 2 practical	- Backward differences	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports

20	1 theoretical, 2 practical	Central differences	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
21	1 theoretical, 2 practical	Solve equations using linear iterative methods	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
22	1 theoretical, 2 practical	Numerical derivation Numerical derivation when points are not equal in dimensions	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
23	1 theoretical, 2 practical	Numerical derivation when points are equal in dimensions	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
24	1 theoretical, 2 practical	Finite differences	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
25	1 theoretical, 2 practical	Forward differences	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
26	1 theoretical, 2 practical	Backward differences	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
27	1 theoretical, 2 practical	Central differences	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
28	1 theoretical, 2 practical	Numerical Integration Trapezoidal Rule	Application software	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports

29	1 theoretical, 2 practical	Mid-point Rule	Applied Examples in Matlab	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
30	1 theoretical, 2 practical	Simpson's Rule	Applied Examples in Matlab	Presentation + direct meeting in the hall and use of the blackboard + laboratory	Monthly exams + laboratory reports
Final Exam					

11. Course Evaluation

Course Assessment	1 st semester				Mid Exam		2 nd semester			Final exam	
	quizzes	Theo.	Theo.	Lab.	Theo.	Lab.	Theo.	Lab.	Proj.	Theo.	Lab.
	2.5	2.5	5	5	5	5	5	5	5	40	20

12. Learning and Teaching Resources

Textbook	References
Sastry, S.S. (2008), "Numerical methods using matlab" Prentice Hall India.	Mathews, J.H. (1999), "Introductory Methods of Numerical Analysis" Prentice Hall.
	Gerald C. F and Wheatley P. O. "Applied Numerical Analysis", Addison Wesley. 1999.
	Attaway, S. (2013). "Matlab: a practical introduction to programming and problem solving". Butterworth-Heinemann.

Curriculum Development plan

New examples and new assignments have been added for all subjects. As well as adding a detailed explanation of matrices, their types and names, and how to perform mathematical

operations on them from addition, subtraction, division, and multiplication of matrices, in addition to how to find the inverse of the matrix, through which we can find the Gauss and Gauss-Gordon method, as well as the use of partial basis. This was added in the third chapter and placed in the vocabulary to facilitate the student's understanding of the topic.

