COURSE DESCRIPTIONS

Faculty	Science and Information Technology				
Department	Mathematics			**NQF level**	6
Course Title	Numerical Analysis I	**Code**	**505321**	**Prerequisite**	505102, s53241
Credit Hours	3	**Theory**	3	**Practical**	0
Course Leader	Dr. Belal Batiha	**email**	b.bateha@jadara.edu.jo		
Lecturers	Dr. Belal Batiha	**emails**	b.bateha@jadara.edu.jo		
Lecture time	10:00- 11:30	**Classroom**	D302		
Semester	First Semester	**Production**	2012	**Updated**	2022

Short Description
Error Analysis, Numerical solutions of linear algebraic equations (Direct and Iterative methods such as Jacobi, Gauss – Seidel, SOR methods), Numerical solutions of non – linear equations, Interpolation, Approximation, Difference equations, Special Types of Matrices, Norms of vectors and Matrices, Eigenvalues and Eigenvectors.
Course Objectives
Upon successful completion of the course, students will be able to 1) Solve the nonlinear equations. 2) Solve the linear system by direct and Iterative methods. 3) Interpolate the values of a function. 4) Compute Norms of vectors and Matrices.

Learning Outcomes
A. Knowledge - Theoretical Understanding
a1. Demonstrate the basic concepts and theorems in numerical analysis.
B. Knowledge - Practical Application
a2. Estimate error bounds and stopping criteria of some numerical methods.
C. Skills - Generic Problem Solving and Analytical Skills
b1. Compute interpolating polynomials of any given functions through arbitrary points.
D. Skills - Communication, ICT, and Numeracy

E. Competence: Autonomy, Responsibility, and Context
c1. Solve linear, non-linear, and system of linear equations with appropriate numerical methods.
Teaching and Learning Methods
• E-learning. • Distance learning using (Microsoft Teams). • Problem based learning (PBL), • Direct students to self-learning through textbooks, library, e-library, and research papers. • Tutorials, and discussion.
Assessment Methods
Participation questions, quizzes, assignments, and exams

Course Contents					
Week	**Hours**	**CLOs**	**Topics**	**Teaching & Learning Methods**	**Assessment Methods**
1	3	a1, b1	Review of Calculus	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
2	3	a1, a2, c1	Error Analysis Bisection method	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
3	3	a2, c1	Fixed-Point iteration Newton's Method	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
4	3	a2, b1, c1	Secant Method Zeroes of Polynomials	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
5	3	a2, b1, c1	Interpolation and the Lagrange polynomial	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
6	3	a2, b1, c1	Divided Differences	Lectures, discussions, and solving selected problems	Participation question, quiz, homework

7	3	a2, b1, c1	Hermit Interpolation	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
8	3	c1	Special Types of Matrices **Midterm Exam 30%**	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
9	3	c1	Leading Principal Submatrix positive definite	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
10	3	c1	Norms of vectors and Matrices	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
11	3	c1	Jacobi method	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
12	3	c1	Gauss-Seidel method	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
13	3	c1	SOR method	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
14	3	c1	Comparing between Jacobi method & Gauss-Seidel method and SOR method	Lectures, discussions, and solving selected problems	Participation question, quiz, homework
15	3	a1, a2, b1, c1	Review		
16	**Final Exam 50%**				

Infrastructure	
Textbook	Burden, R. L. & Faires, J. D. (2016). *Numerical analysis*, 10th ed. Cengage Learning
References	1) Cheney, E. W. & Kincaid, D. R. (2012). *Numerical mathematics and computing*. Cengage Learning. **2)** Conte, S. D., & De Boor, C. (2018). *Elementary numerical analysis: an algorithmic approach*. Society for Industrial and Applied Mathematics
Required reading	
Electronic materials	
Other	

Course Assessment Plan							
Assessment Method		**Grade**	**CLOs**				
			a1	**a2**	**b1**	**c1**	
First(Midterm)		30	5	3	10	12	
Second (if applicable)							
Final Exam		50	26	4	4	16	
Coursework							
Coursework assessment methods	Assignments	10	2	3	2	3	
	Case study						
	Discussion and interaction						
	Group work activities						
	Lab tests and assignments						
	Presentations						
	Quizzes	10	2	3	2	3	
Total		100	35	11	17	37	

Plagiarism
Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code). Plagiarism is different from group work in which a number of individuals share ideas on how to carry out the coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. In order to allow proper assessment that this is indeed the case, you must adhere strictly to the course work requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.