Course Description Form

1. Course Name:
Numerical Analysis
2. Course Code:
WBM-32-02
3. Semester / Year:
Semester2/2024
4. Description Preparation Date:
2024−03−20
5. Available Attendance Forms:
Presence in the classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
120 Hours / 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Aymen Mohammed Jebur Email: ayman.mo@uowa.edu.iq
8. Course Objectives

Course Objectives	• To provide the numerical methods of solving the non-linear equations, interpolation, differentiation, and integration . • To improve the student's skills in numerical methods by using numerical analysis software and computer facilities.
9. Teaching and Learning Strategies	
Strategy	1- The student will be able to use numerical methods to solve equations and employ them appropriately. 2- Gaining experience and knowledge in the types of differential equations and methods of solving them numerically. 3-. Gain experience and knowledge in solving types of integrals numerically. 4- Making the student able to demonstrate real knowledge of mathematical concepts during the academic level and their applications in the engineering field. 5- Develop an understanding of the basic ideas and concepts of numeri methods.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Linear Interpolation: Newton-Gregory	Learning the calculation using technique of estimati the value of a functi for any intermediate value of the independent variable	Lectures presented PDF format	Daily exams + homework assignments + monthly exams
2	2	Linear Interpolation: Lagrange interpolating polynomial	Learning the calculat of the Lagrange interpolating polynomial of lowest degree that interpolat a given set of data.	Lectures presented in PDF format	Daily exams homework assignments monthly exams
3	2	Interpolation: General Equation	Learning the calculation using technique of General Equation	Lectures presented in PDF format	Daily exams homework assignments monthly exams
4	2	Numerical integration: Equal segments Trapezoidal method	To calculate the area under the curve of a function plotted on a graph. The trapezoidal rule that computes a function f(x) with a set of linear functions	Lectures presented in PDF format	Daily exams homework assignments monthly exams
5	2	Numerical integration: Unequal segments Trapezoidal method	To calculate the area under the curve of a function plotted on a graph. The trapezoidal rule that computes a function f(x) with a set of linear functions.	Lectures presented in PDF format	Daily exams homework assignments monthly
6	2	Numerical integration: Simpson's rules	Learning the calculation using technique of Simpson's rules which solves several approximations for definite integrals	Lectures presented in PDF format	Daily exams homework assignments monthly
7	2	Numerical Integration:	Learning the calculation of the definite integral of	Lectures presented in PDF format	Daily exams homework

		Gaussian Quadrature Method	a function, usually stated as a weighted sum of function values at specified points within the domain of integration.		assignments monthly
8	2	Solution of non-linear equations: Bisection method	Learning the numerical calculation of the bisection method which is one of the first numerical methods developed to find the root of a nonlinear equation.	Lectures presented in PDF format	Daily exams homework assignments monthly
9	2	Solution of non-linear equations: Newton Raphson method	Learning the numerical calculation of the Newton-Raphson method which is the method of choice for solving nonlinear systems of equations	Lectures presented in PDF format	Daily exams homework assignments monthly
10	2	Solution of non-linear equations: Secant method	Learning the numerical calculation of the Secant method which is a very effective numerical procedure used for solving nonlinear equations of the form f(x) = 0	Lectures presented in PDF format	Daily exams homework assignments monthly exams
11	2	Numerical solution of ODE: Taylor series	Learning the numerical calculation of the Taylor series that provides a means to predict a function value at one point	Lectures presented in PDF format	Daily exams homework assignments monthly exams
12	2	Euler method and modified Euler method	in terms of the function value and its derivatives at another point.	Lectures presented in PDF format	Daily exams homework assignments monthly exams
13	2	Runge - Kutta method	Learning the numerical calculation of the Euler's method	Lectures presented in PDF format	Daily exams homework assignments monthly exams

			which is the first order numerical methods for solving ordinary differential equations with given initial value.		
14	2	Finite differences method	To calculate using the technique of Runge - Kutta method for solving the initial-value problems of differential equations.	Lectures presented in PDF format	Daily exams homework assignments monthly
15	2	Matrix method	Learning the numerical calculation of the finite differences method for solving partial differential equations.	Lectures presented in PDF format	Daily exams homework assignments monthly

11. Course Evaluation

- Daily exams with practical and scientific questions.
- Participation scores for difficult competition questions among students
- Establishing grades for environmental duties and the reports assigned to them
- Semester exams for the curriculum, in addition to the mid-year exam and final exam

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Numerical Methods of Engineers, Chapra &Canale, Edition.
Main references (sources)	Applied Numerical Analysis, Gerald & Wheatley, Edition.
Recommended books and references (scientific journals, reports…)	All solid scientific journals that are related the broad concept of mathematical theor and their results.