



Jordan University of Science and Technology
Faculty of Engineering
Mechanical Engineering Department

ME306 Numerical Methods For Engineers

First Semester 2021-2022

Course Catalog

3 Credit Hours. Errors in computations. Roots of equation. System of linear algebraic equations including eigenvalues problems. Interpolations and curve fitting. Numerical integration and differentiation. Ordinary differential equations including boundary and initial value problems. Introduction to numerical solution of partial differential equation.

Text Book

Title	Numerical Methods for Engineers
Author(s)	S. C. Chapra and R. P. Canale,
Edition	7th Edition
Short Name	Text Book
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Reference	Applied Numerical Methods with Matlab for Engineers and scientists	S. C. Chapra	3rd Edition	

Instructor

Name	Dr. AHMAD BATAINEH
Office Location	-
Office Hours	
Email	ambataineh2@just.edu.jo

Class Schedule & Room

Section 1:

Lecture Time: Mon : 10:00 - 11:30

Room: M5126

Section 2:

Lecture Time: Mon : 11:30 - 13:00

Room: M2010

Section 3:

Lecture Time: Wed : 10:00 - 11:30

Room: M5126

Section 4:

Lecture Time: Wed : 11:30 - 13:00

Room: M2010

Prerequisites

Line Number	Course Name	Prerequisite Type
253053	ME305 Applied Math For Engineers	Prerequisite / Study
2001140	NE114 Programming For Engineers	Prerequisite / Study

Tentative List of Topics Covered

Weeks	Topic	References
Weeks 1, 2	Chapter 3: Error Analysis/Approximations and Round-off Errors: 3.1- Significant Figures, 3.2- Accuracy and Precision, 3.3- Error Definitions Chapter 4: Error Analysis/Approximations and Round-off Errors: 4.1- The Taylor Series , 4.3- Total Numerical Error	
Weeks 3, 4, 5	Chapter 5: Roots of Equations/ Bracketing Methods: 5.2- The Bisection Method, 5.3- The False Position Method' 5.4- Incremental Searches and Determining Initial Guesses Chapter 6: Roots of Equations/ Open Methods: 6.1- Simple fixed-Point Iteration, 6.2- The Newton-Raphson Method, 6.3- The Secant Method and Modified Secant Method, 6.4- Multiple Roots, 6.5- Systems of Nonlinear Equations	
Weeks 6, 7, 8, 9	Chapter 9: Linear Algebraic Equations/ Gauss Elimination: 9.1- Solving Small Numbers of Equations, 9.2- Na?ve Gauss Elimination, 9.3- Pitfalls of Elimination Methods, 9.4- Techniques for Improving Solutions, 9.7- Gauss-Jordan Chapter 10: Linear Algebraic Equations/ LU Decomposition and Matrix Inversion: 10.1- LU Decomposition, 10.2- The Matrix Inverse Chapter 11: Linear Algebraic Equations/ Special Matrix and Gauss-Seidel: 11.1- Special Matrices, 11.2- Gauss-Seidel and Jacobi Iteration	
Weeks 10, 11	Chapter 17 : Curve Fitting/ Least-Squares Regression 17.1- Linear Regression, 17.2- Polynomial Regression 17.3 multiple regression Chapter 18: Curve Fitting/ Interpolation 18.1- Newton's Divided-Difference Interpolating Polynomials, 18.2- Lagrange Interpolating Polynomial	
Weeks 12, 13	Chapter 21: Numerical Differentiation and Integration/ Newton-Cotes Integration Formulas 21.1- The Trapezoidal Rule, 21.2- Simpson's Rules, 21.3- Integration with Unequal Formulas	

Weeks 14, 15, 16	Chapter 23: Numerical Differentiation and Integration/ Numerical Differentiation 23.1- High-Accuracy Differentiation Formulas, 23.3- Derivatives of Unequally Spaced Data Chapter 25: Ordinary Differential Equations/ Runge-Kutta Methods 25.1- Euler's Method, 25.2- Improvements of Euler's Method, 25.3- Runge-Kutta Methods, 25.4- Systems of Equations	
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Mapping of Course Outcomes to Program Student Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Understand useful computing techniques for solving general and practical engineering problems [1SLO1]	100%	
Integrate computer applications into practical engineering solutions [1SLO1]	100%	
Estimate numerical errors in application of numerical methods and recognize their importance in real life applications [1SLO1]	100%	
Ability to present numerical results in appropriate fashion [2SLO1, 1SLO3]	100%	
Strengthen programming skills using compilers or packages such as MATLAB [2SLO1, 1SLO7]	100%	
Ability to solve problems using numerical techniques including those in root finding, linear systems, curve fitting, integration, differentiation, and ODEs [1SLO1]	100%	

Relationship to Program Student Outcomes (Out of 100%)																	
A	B	C	D	E	F	G	H	I	J	K	SLO1	SLO2	SLO3	SLO4	SLO5	SLO6	SLO7
											533.33		33.33				33.33

Evaluation	
Assessment Tool	Weight
First Exam	25%
Second Exam	25%
Final Exam	40%
HWs and Quizzes	10%

Policy	
policy	<ul style="list-style-type: none"> - The attendance is mandatory. Any student who miss 20% of the class will be barred from class. - Late student will be considered absent. - No cellphones are allowed during class. - All cellphones should be turned OFF during exams.