Jordan University of Science and Technology

Faculty of Engineering

Industrial Engineering Department

IE311 Numerical Methods - JNQF Level: 7

First Semester 2023-2024

Course Catalog
3 Credit Hours. Machine epsilon; Round-off error; Linear system of equations; Non-linear equations; Gauss elimination and iterative methods; Largest eigenvalue using power methods; Spline interpolation; Numerical integration; Ordinary differential equations; Non-linear equations; Least square fitting.

Text Book	
Title	Applied Numerical Methods with Matlab for Engineers and Scientists
Author(s)	Steven Chapra
Edition	3rd Edition
Short Name	Reference 1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Reference 2	Applied numerical analysis	F. Gerlard and P.O. Wheatly	6th Edition	

Instructor	
Name	**Dr. Jumah Amayreh**
Office Location	N2 L2
Office Hours	Sun : 11:30 - 13:30 Mon : 08:30 - 09:30 Tue : 10:30 - 12:30 Thu : 08:30 - 09:30
Email	jumah@just.edu.jo

Class Schedule & Room

Section 1:
Lecture Time: Sun, Tue : 08:30 - 09:30
Room: CH2110

Prerequisites		
Line Number	**Course Name**	**Prerequisite Type**
902030	MATH203 Ordinary Differential Equations	Prerequisite / Study

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	Mathematical Modeling, Numerical Methods and Problem Solving	From **Reference 1**
Weeks 1, 2, 3	Roundoff and Truncation Errors	**Chapter 4** From **Reference 1**
Weeks 3, 4	Roots: Bracketing methods (Bisection and False-position methods)	**Chapter 5** From **Reference 1**
Weeks 5, 6	Roots: Open methods (Simple Fixed-point, Newton-Raphson, and Secant methods)	**Chapter 6** From **Reference 1**
Weeks 6, 7, 8, 9	Linear Systems (Gauss elimination, LU Factorization, Cramer's rule, Matrix inverse and Condition, Gauss-Seidal and Jacobi)	**Chapters 8, 9, 10, 11, and 12** From **Reference 1**
Weeks 9, 10	Curve Fitting: Least square regression, general linear least square, and nonlinear regression	**Chapters 14, 15** From **Reference 1**
Week 11	Interpolation: Newton's divided- difference and Lagrange interpolating polynomials, and Spline interpolation	**Chapters 17, 18** From **Reference 1**
Weeks 12, 13	Numerical integration formulas: Trapezoidal and Simpson's rules, single and multiple application, integration with unequal segments, multiple integrals	**Chapter 19** From **Reference 1**
Weeks 13, 14	Numerical differentiation: Forward, centered and backward finite-divided difference formulas, unequally spaced data	**Chapter 21** From **Reference 1**
Weeks 15, 16	Solving differential equations: Eular, Heun, mid-point, and general Runge-Kutta methods, system of equations, boundary value problem	**Chapters 22, 23, & 24** From **Reference 1**, From **Reference 2**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Ability to solve problems using numerical techniques including those in root finding, linear systems, curve fitting, integration, differentiation, and ODEs. [1SO1, 1SO2] [1L7S1]	50%	
Identify useful computing techniques for solving general and practical engineering problems. [1SO1] [1L7K1]	15%	

Apply programming skills using compliers or packages such as MATLAB. [1SO2] [1L7S2]	10%	
Present numerical results in an appropriate fashion. [1SO2] [1L7S2]	10%	
Estimate numerical errors in the application of numerical methods and recognize their importance in real-life applications. [1SO3] [1L7S3]	15%	

Relationship to Program Student Outcomes (Out of 100%)						
SO1	SO2	SO3	SO4	SO5	SO6	SO7
40	45	15				

Relationship to NQF Outcomes (Out of 100%)			
L7K1	L7S1	L7S2	L7S3
15	50	20	15

Evaluation	
Assessment Tool	**Weight**
First exam	30%
Second Exam	30%
Final Exam	40%

Policy	
Attendence	Attendance will be checked at the beginning of each class. University regulations will be strictly followed for students exceeding the maximum number of absences. No make-up test will be given without an official university-approved excuse.
Academic Honesty	It is the responsibility of each student to adhere to the principles of academic integrity. Academic integrity means that a student is honest with him/herself, fellow students, instructors, and the university in matters concerning his or her educational endeavors. Cheating will not be tolerated in this course. University regulations will be pursued and enforced on any cheating incident.

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