JORDAN UNIVERSITY OF SCIENCE & TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT
ME 306 Numerical Methods for Engineers
_____ Semester

Catalog Data- 2013 : 3 credit hours. This course introduces students to the formulation, methodology, and techniques for numerical solution of engineering problems. Topics covered include: computers and error analysis, root finding, solution of linear, numerical integration and differentiation, and solution of ordinary differential equations. Also, Partial differential equations and their numerical solution are briefly discussed in this course.

Text Book(s): Chapra, S. C. and Canale, R. P. (2006), *Numerical Methods for Engineers*, 6th Edition, McGraw-Hill, Inc.

References:
- Chapra, S. C. (2012), *Applied Numerical Methods with Matlab for Engineers and Scientists*, 3rd Edition, McGraw-Hill, Inc.
- Any good text book in the subject.
- Internet resources.

Instructor: _____

Class Schedule: _____

Office Hours: _____

Attendance: The attendance to this course is mandatory. Any student who misses 20% of the classes will be given notice to withdraw from the class or his registration will be cancelled.

Pre/Co-Requisites: ME 305, CS 114

Objectives: Upon the completion of the course, students should be able to:

- Understand useful computing techniques for solving general and practical engineering problems.
- Integrate computer applications into practical engineering solutions.
- Estimate numerical errors in application of numerical methods and recognize their importance in real life applications
- Ability to present numerical results in appropriate fashion.
- Strengthen programming skills using compliers or packages such as MATLAB
- Ability to solve problems using numerical techniques including those in root finding, linear systems, curve fitting, integration, differentiation, and ODEs.

Topics Covered:

1.	Introduction – computers and error analysis	3 Hours
2.	Truncation errors and Taylor series	3 Hours
3.	Roots of equations – Bi-section, Newton-Raphson, Secant method, system of non-linear equations	8 Hours
4.	Systems of linear algebraic equations – Gauss elimination, LU decomposition, Gauss-Seidel, Gauss-Jordan matrix inverse	5 Hours
5.	Curve fitting – linear and non-linear least square regressions	5 Hours
6.	Curve fitting – interpolation, linear interpolation, Lagrange interpolation polynomials, Newton interpolation, spline interpolation	5 Hours
7.	Numerical differentiation	3 Hours
9.	Numerical integration	4 Hours
10.	Ordinary differential equations – initial-value, boundary-value	8 Hours
11.	Partial differential equations – finite difference methods (if time allows)	2 Hours

Computer Usage: Heavily involved

Design Activities/Project(s):

Lab. Experiment(s):

Scientific Visit(s):

Evaluation:

1st Exam :	20-30%
2nd Exam: :	20-30%
HW, quizzes, projects, attendance	0-20%
Final exam	40%

Relationship of the Course to ME Outcomes:

ABET a – k	√	Mechanical eng. Program Outcomes
a	√	a. Apply knowledge of mathematics, science, and engineering in practice.
b		b. Design and conduct experiments as well as analyze and interpret data.
c		c. Design a system, components, or process to meet desired needs.
d		d. Function on multidisciplinary teams.
e		e. Identify, formulate, and solve engineering problems.
f		f. Understanding of professional and ethical responsibility of an engineer.
g		g. Communicate effectively.
h		h. Broad education to understand the impact of engineering solutions in global and societal context.
i		i. Recognition of the need for, and possess the ability to engage in, lifelong learning.
j		j. Possess knowledge of contemporary issues.
k	√	k. Use the techniques, skills, and modern engineering tolls necessary for engineering practice.
		l. Adhere to safety rules and regulations.

ABET Category:

Engineering Science	0	Credits
Engineering Design	0	Credits

Prepared By: _____ **Date:** _____