

FLORIDA INTERNATIONAL UNIVERSITY
Department of Civil and Environmental Engineering
EGN5455 – Numerical Methods in Engineering
Spring 2012 – Course Syllabus

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Office Hours: Monday & Friday 2:00 – 3:30 P.M. For other time, please make an appointment at the Advising Center or view day schedule at <https://web2.eng.fiu.edu/advising2>

Course Objectives: The primary objective of this course is to introduce students to the use of numerical methods in the context of engineering. It is intended to expose students to numerical techniques that can be used to obtain approximated solutions of governing equations for different engineering problems.

By the end of the semester, students are expected to understand the basics of:

- Mathematical models and governing equations.
- Numerical solutions for these governing equations.
- Programming in Matlab, Mathcad, or equivalent.

Prerequisites: Undergraduate calculus, differential equations and computer tools. Linear algebra recommended.

Textbook: *Applied Numerical Methods for Engineers and Scientists* by Singiresu Rao, Prentice Hall, 2002.
ISBN-10: 013089480X
ISBN-13: 9780130894809

Matlab, Mathcad, or equivalent software will be required for some homework problems. You can access these software packages through:

www.eic.fiu.edu

Citrix Portal

Course Contents:

Date	Agenda
1/10	Introduction to Numerical Methods: purpose, scope and logistics of the class (Chapter 1)
1/12	Solution of nonlinear algebraic equations (Chapter 2)
1/19	Solving sets of linear algebraic equations (Chapter 3)
1/26	Matrix and tensors: eigenvalues and eigenvectors (Chapter 4)
2/2	Curve fitting and interpolation (Chapter 5)
2/14	Statistical analysis (Chapter 6)
2/21	Numerical differentiation (Chapters 7)
2/28	First Exam (Chapters 1-6)
3/1	Numerical Integration (Chapter 8)
3/8	Numerical solution of ordinary differential equations: initial value problems (Chapter 9)
3/12-16	Spring Break
3/20	Numerical solution of ordinary differential equations: boundary value problems (Chapter 10)
3/27	Numerical solution of partial differential equations: time stepping and spatial discretization; accuracy and stability of numerical solutions (Chapter 11)
4/3	Optimization and linear programming (Chapter 12)
4/10	Introduction to the Finite Element Method and its application to numerical solutions of ordinary and partial differential equations (Chapter 13)
4/17-19	Class Project Presentations
4/26	Final Exam 9:45 - 11:45 A.M. (Chapters 7-13)

**Graded
Assignments:**

There will be a total of 5 graded assignments and they will be presented as follows

- Work is to be submitted in paper when requested, or as a file e-mailed as an attachment to:
egn5455.section1@gmail.com
- Homework is due at the beginning of the class; late assignments will not be graded.
- Assignment's files e-mailed to the instructor personal account will be automatically deleted; therefore, they will not be graded.
- In order to obtain full credit, your homework in paper must contain the following information in the first page: (a) Course name and section. (b) Student's name and panther ID. (c) Assignment name and number. (d) Date.
Your e-mailed file must be named with your name and the assignment name and number.
Ex. Cora_Martinez_Homework_1.xlsx
- No assignments will be reviewed at the end of the course with the intention of a grade change. Reviews can be done immediately after work is returned to the student.

Course Project:

This team project (2 students) can address a problem solution in solids, structures, dynamics, fluids, statistics, optimization or any other engineering problem. The objective with this task is that every student obtains hand-on experience in solving engineering problems using a self-developed numerical procedure. Please choose a tractable problem that can be analyzed in depth in the limited amount of time available.

Exams:

There will be two exams to evaluate student's mastery of the fundamental theory and application of numerical methods in engineering.

**Evaluation
and Grading:**

Homework: 50%
Exam 1: 15 %
Exam 2: 15 %
Final Project: 15%
Project Presentation: 5%

- A make-up for a missing assignment or exam will only be possible with a certified medical excuse or legitimate emergency, or if the specific circumstance is discussed with the instructor prior to the exam.
- Grades for borderline percentages will strongly depend on attendance, class participation and overall performance in the course.
- Letter grades in this course will be assigned based on the following scale:

Score (%)	Grade
90-100	A
85-89	A ⁻
80-84	B ⁺
75-79	B
70-74	B ⁻
65-69	C ⁺
60-64	C
55-59	C ⁻
50-54	D ⁺
45-49	D
40-44	D ⁻
0-39	F

Moodle site: All class material can be accessed through Moodle.

<https://moodle2.fiu.edu/login/>

Academic Misconduct: Students are expected to uphold the standards of academic integrity and the policies of the University regarding conduct. Cheating and plagiarism will not be tolerated; these offenses can result in failing the course, suspension or expulsion from the University.

Refer to FIU Student Handbook for full details on what constitutes academic dishonesty and misconduct, as well as the procedures for resolution of pertaining matters within the University judiciary procedures.