DEPARTMENT: MECHANICAL ENGINEERING

COURSE #: EGN 3454, 3 credits Course Website	**COURSE TITLE:** Numerical Methods for Mechanical Engineers
TYPE COURSE: Technical Elective	**TERMS OFFERED:** Spring
CATALOG DESCRIPTION: The objective is to teach programming and numerical methods to solve engineering/scientific problems in an effective and efficient manner to meet the needs of industry, government, and academia. To achieve the objective, the course will leverage on the use of MATLAB which is now widely used for scientific computing. This course is intended to keep students engaged and have them develop practical programming skills. The course will rely heavily on in-class programming to provide feedback to students.	**PREREQUISITES:** MAC2313 Calculus III, MAP2302 Differential Equations The students should have understanding of linear algebra. We do not assume expert knowledge of programming for students entering this class
AREA COORDINATOR: Dr. Juan Ordonez **RESPONSIBLE FACULTY:** Dr. Kunihiko Taira **INSTRUCTOR OF RECORD:** Dr. Kunihiko Taira 　　　AME Center, Rm 216 　　　(850) 645-0140 　　　ktaira@eng.fsu.edu 　　　Office Hours: (open-door policy) **DATE OF PREPARATION:** 10/18/17 (KT)	**CLASS SCHEDULE:** **Class:** Two times weekly for 1 hr. and 15 min. **Lab:** in class programming
TEXTBOOKS/REQUIRED MATERIAL: S. Chapra, Applied Numerical Methods with MATLAB, McGraw-Hill (any edition)	**SCIENCE/DESIGN (%):** 90% / 10% **CONTRIBUTION TO MEETING THE PROFESSIONAL COMPONENT:** 90% engineering science 10% engineering design
COURSE TOPICS: The topics to be covered includes (not necessarily in the order shown) 1. Programming/MATLAB fundamentals 2. Modeling and Problem Solving 3. Programming with MATLAB 4. Graphics/computer logic 5. Basics of numerical methods 6. Root solver 7. Matrix equation solver 8. Least squares 9. Interpolation 10. Numerical integration 11. Numerical differentiation 12. Ordinary differential equations 13. Partial differential equations	**ASSESSMENT TOOLS:** 1. Weekly Homework problems (30%) 2. Projects (30%) 3. Midterm examination (20%) 4. Final examination (20%)
Student Learning Objectives for FSU	By the end of the course, a student should be able to:

Curriculum File Syllabus	1. read and write computer programs 2. translate numerical concepts to computer programs 3. develop a numerical algorithm and understand its numerical characteristics 4. solve engineering problems using computer programing 5. to discuss and analyze results obtained from numerical solvers
Justification for addition or change	Course is needed to satisfy the growing need to train students with computer programming skills to tackle Mechanical Engineering problems.

Level of computer usage:	None ☐ Elementary ☐ Intermediate ☑ Advanced ☐
Modes of Instruction:	Lecture ☑ Lab ☐ DIS ☐ Discussion ☐ Other ☐
Core Curriculum Course:	Yes ☐ No ☑
Availability to other Majors:	Yes ☑ No ☐

ME COURSE OBJECTIVES* [related to ABET Student Outcomes]	(Numbers shown in brackets refer to department **Student Outcomes** – Please ask Dr. Hollis to check these numbers) http://www.eng.fsu.edu/me/about_us/accred-info.html 1. To provide introduction to computer programing and logic. [1, 5, 9, 10] 2. To provide an introduction to numerical methods. [1, 5, 9, 10] 3. To provide experience in verifying the accuracy of numerical solutions. [1, 2, 5] 4. To provide expertise to apply numerical methods to engineering problems. [1, 2, 5] 5. To provide hands-on experience in designing and developing computer programs through in-class programing lessons. [1, 2, 5, 6, 7, 8, 9, 10] Numbers refer to Departmental Student Outcomes, e.g. for course object 1, [1, 5, 9, 10] refers to student outcomes 1, 5, 9, and 10.
ME COURSE OUTCOMES* [related to ME Course Objective] **= FSU Student Learning Objectives**	*(Numbers shown in brackets are links to Course Objectives above) By the end of the course, a student should be able to: 1. Be able to read and write computer programs [1, 2, 3, 4] 2. Be able to translate numerical concepts to computer programs [1, 2] 3. Be able to develop a numerical algorithm and understand its numerical characteristics [1, 2] 4. Be able to solve engineering problems using computer programing [1, 4] 5. Be able to discuss and analyze results obtained from numerical solvers [1, 2, 3, 4] Numbers refer to Course Objectives below, e.g. for course outcome 3, [1.2] refers to course objectives 1 and 2.

<div align="center">**ASSESSMENT TOOL DETAILS**</div>

GRADING/ EVALUATION:

Grades will be based on the following breakdown of graded work:

Homework	30%
Project & Presentation	30%
Midterm Examination	20%
Final Examination	20%

Letter grades will be assigned equivalent to the following:

Undergraduate Grading Scale	
Numerical Score	**Letter Grade**
90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
0 - 59	F

Departmental policy is that a grade of C or better is required to pass this course.

College of Engineering Undergraduate Policy:
- It is the policy of the College not to assign "plus and minus (+/-)" grades for undergraduate engineering courses. http://www.eng.fsu.edu/current/undergraduate/guide.html, see Grading Policies.
- Students are required to be familiar with Academic Policies and Requirements as outlined in the COE Student Handbook http://www.eng.fsu.edu/current/undergraduate/guide.html page 11

ASSIGNMENTS/RESPONSIBILITIES:

Student Responsibilities
- Participation Attendance
- Homework
- Projects, including presentations
- Examinations

Assessment Tools:
1. Homework
2. Projects, including presentations
3. Examinations

Examinations:

The date of all exams will be announced at least one (1) week in advance.

Final Examination: on the COE exam date see http://www.eng.fsu.edu/current/exam_schedule.html

Instructional Method(s)

The primary instructional method is in-class lecture with computer programing exercises. There will also be extensive use of the Blackboard web delivery system for distribution of course assignments and other materials. Course materials available from the textbook publisher may also be used. The use of online instructional techniques will be introduced.

COURSE SCHEDULE

Week	Topics to be covered (not necessarily in the order shown)
1	Programming/MATLAB fundamentals
2	Modeling and Problem Solving
3	Programming with MATLAB
4	Graphics/computer logic
5	Basics of numerical methods
6	Root solver
7	Matrix equation solver
8	Least squares
9	Interpolation
10	Numerical integration
11	Numerical differentiation
12	Ordinary differential equations
13	Partial differential equations
14	Programming/MATLAB fundamentals
15	Modeling and Problem Solving

COURSE POLICIES:

Attendance Policy:

First day attendance is mandatory for FSU students, and first week attendance is mandatory for FAMU students. Students not in class during the first day (FSU) or first week (FAMU) are to be dropped from the course.

Excused Absences: Excused absences include documented illness, deaths in the immediate family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse Consideration will also be given to students whose dependent children experience serious illness.

Please note that the College of Engineering has a restrictive interpretation of what is considered a valid excuse for an absence. See: http://www.eng.fsu.edu/current/undergraduate/guide.html p. 5. If an absence is to be excused, make sure you check beforehand. In case of excused absence, the instructor will work with you to help you make up for missed time and catch up.

Unexcused Absences: A student having more than four unexcused absences will be dropped from the course and assigned the grade F. No exceptions. Tests and exams missed because of unexcused absence receive the grade 0. No exceptions.

Other projects and activities missed completely receive the grade 0 for those projects or activities. No exceptions.

Other Regulations

Note that the penalties for copying work may result in a failing grade for the course. If you are uncertain, please check with the instructor who assigned the work. Working together is encouraged in this course, but blatant copying is not.

Departmental Policy:

A student may continue in the B.S. in ME degree program unless one or more of the following conditions arise;

a. A grade below C in the second attempt of the same engineering course
   http://www.eng.fsu.edu/me/resources/pdf/ME_Prerequisite_Policy.pdf
b. More than three (3) repeat attempts in engineering courses.
   http://www.eng.fsu.edu/me/resources/pdf/ME_Excessive_Repeat_Policy.pdf
c. Violation of academic honor code as defined in university bulletin or catalog

d. Use of grade forgiveness (currently available for FAMU students only) in more than two (2) courses.

Make-up Assignments

In case of emergency, situation beyond one's control, or for other valid reasons, students will be given an opportunity for making up the missed assignments or examinations. Valid excuses include documented illness (including illness of a dependent child), death of an immediate family member, military service obligation, observance of religious holy days, and official university activities. You must notify the instructor in advance when the excused absence is a planned event such as the observance of a religious holy day or an official university activity. Proof of valid reason may be required.

DEPARTMENTAL STUDENT OUTCOMES

The department's student outcomes can be found at
http://www.eng.fsu.edu/about/accreditation/program_outcome.html?ID=215&agency=ABET

Program Outcomes/Student Learning Outcomes

Student learning outcomes for students majoring in engineering may be found at
http://www.eng.fsu.edu/outcomes

Location of Academic Learning Compacts (ALC)

COE: http://www.eng.fsu.edu/about/accreditation/program_outcome.html?ID=217&agency=ALC
FAMU: http://www.famu.edu/index.cfm?Assessment&CurrentALCs#engineering
FSU: http://learningforlife.capd.fsu.edu/smalcs/learningCompact.cfm?smalcId=62534

ACADEMIC HONOR POLICY

Students are expected to uphold the University Student Code of Conduct and/or University Academic Honor Code

The Florida A&M University is committed to academic honesty and its core values which include scholarship, excellence, accountability, integrity, fairness, respect, and ethics. These core values are integrated into its academic honesty policy. Being unaware of the Academic Honesty Policy is not a defense to violations of academic honesty. Academic Honesty Policy violations shall be reported and appropriate actions taken by the Department Chair and Associate Dean for Student Affairs and curriculum. The complete Florida A&M Student Code of Conduct - Regulation 2.012 (8a) can be found on (p. 5)
http://www.famu.edu/judicialAffairs/Regulation%202_012%20Student%20Code%20of%20Conduct.pdf
and in the Student Handbook "The Fang" p. 61
http://www.famu.edu/Students/STUDENT%20HANDBOOK%20%28FANG%29%202012-2014.Updated%208.22.13.pdf p 61

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at http://fda.fsu.edu/Academics/Academic-Honor-Policy.)

AMERICANS WITH DISABILITIES ACT

During the first week of class students with disabilities needing academic accommodation should:

1) register with and provide documentation to the FAMU **LDEC** or FSU **SDRC**; and
2) bring a letter to the instructor indicating the need for accommodation and what type.

Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from the Student Disability Resource Center has been provided.

For more information about services available to FAMU students with disabilities, contact **The Learning Development and Evaluation Center (LDEC)**

677 Ardelia Court Florida A&M University Tallahassee, FL 32310 Nathaniel Holmes, Director Donna Shell, Asst. Director	599-3180 (phone) 561-2512 (fax) 561-2783 (TDD) http://www.famu.edu/index.cfm?a=EOP&p=ADA

For more information about services available to FSU students with disabilities, contact the:
Student Disability Resource Center (SDRC)

874 Traditions Way 108 Student Services Building Florida State University Tallahassee, FL 32306-4167	(850) 644-9566 (voice) (850) 644-8504 (TDD) sdrc@admin.fsu.edu http://www.disabilitycenter.fsu.edu/

This syllabus and other class materials are available in alternative format upon request.

UNIVERSITY'S NON-DISCRIMINATION POLICY STATEMENT

FAMU: http://www.famu.edu/index.cfm?EOP&NON-DISCRIMINATIONPOLICYSTATEMENT
FSU: http://www.hr.fsu.edu/PDF/Publications/diversity/EEO_Statement.pdf

SYLLABUS CHANGE POLICY:

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advanced notice.