Introduction to Numerical Methods of Engineering Analysis
EGM 3344 Section 2605 Class# 13873

Class Periods: MWF 9 (4:05 pm to 4:55 pm)
Class Location: WEIL 270
Academic Term: Fall 2019

It may become necessary to modify this syllabus during the semester.
In this event, students will be notified and the revised syllabus will be posted on the course web site.

Instructor:
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352-392-0888
Office Hours: MW 10:30 -12:00 am @ 307 Nuclear Science Building
(I will be moving my office to New Engineering Building during the semester. I will update you once I move)
Teaching Assistants: Mr. Bo Han Huang: Office Hours: Tu & Fr 10:30-11:30
Grader: Zheng Ren

Catalog Description
Methods for numerical solution of mathematical problems, with emphasis on engineering applications and computer implementation in MATLAB. Modeling, computers, and error analysis. Roots and optimization. Linear algebraic equations and matrices. Curve fitting; Numerical differentiation and integration. Ordinary differential equations. Credits: 3.

***Course Pre-Requisites &* Co-requisites**
MAC 2313 Analytic Geometry and Calculus 3; *COP 2271, or equivalent* Computer Programming for Engineers Matlab
Co-requisites: MAP 2302 Elementary Differential Equations

Course Objectives
The objective of the course is to teach students how to apply computational methodologies to solve engineering problems when no closed-form, analytical solution exists. Students will learn the basics of using structured programming to combine engineering knowledge, judgment, and intuition to develop reasonable approximations and numerical solutions. Emphasis will be placed on understanding the basic concepts behind the various numerical methods studied, implementing basic numerical methods using the MATLAB structured programming environment, and utilizing more sophisticated numerical methods provided as built-in MATLAB functions. The objective will be achieved through:

- In class lectures and examples
- Student completion of homework and projects
- Student preparation for and completion of exams

Professional Component (ABET):
This course prepares graduates to apply knowledge of calculus based physics to engineering modeling, knowledge of advanced mathematics through multivariate calculus and differential equations to engineering problem solving, and knowledge of statistics and linear algebra to data analysis.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3) an ability to communicate effectively with a range of audiences	Low
4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Low

*Coverage is given as high, medium, or low. An empty box indicates that this outcome significantly addressed by this course.

Materials and Supply Fees

None

Required Textbooks and Software

- *Applied Numerical Methods with MATLAB for Engineers and Scientists,* Steven C. Chapra, 2017, Forth Edition, McGraw Hill, ISBN number: 978-0073397962

- Software: MATLAB Student Version (any recent version should be fine)

  You may consider using UFApps to access a number of popular software applications for "free" including Matlab at: http://info.apps.ufl.edu/

  Matlab is also available for purchase and download at
  http://www.mathworks.com/academia/student_version/index.html

Additional Recommended Materials

None.

Course Schedule

See table at end of syllabus.

Attendance Policy, Class Expectations, and Make-Up Policy

Regular class attendance is expected. Students attendance will be collected randomly and course attendance will be a factor in determining course grade. Late HW and makeup exams are only allowed for students with documented circumstances consistent with UF policy. Excused absences must be consistent with university policies in the undergraduate catalog and require appropriate documentation. For more information on UF policies see
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx
No early exam will be given to ANY student.

Evaluation of Grades

- Homework will be assigned regularly during the semester.
- Class participation will be a factor. For individuals in the gray area between two grades, performance on the homework and attendance will be used to make the final decision.
- 3 hourly exams will be given during the regular class period.
- The final exam is given at the time scheduled by the registrar.

Assignment		**Percentage of Final Grade**
Homework		10%
Projects (2)		5% + 5 %
Exam 1	Wed Sept. 18	16%
Exam 2	Mon Oct. 21	16%
Exam 3	Wed Nov. 20	16%
Final exam (cumulative)	Dec. 9 @ 10:00 AM - 12:00 PM	32%
		100%

Grading Policy

Percent	**Grade**	**Grade Points**
90 - 100	A	4.00
87 - 89	A-	3.67
84 - 86	B+	3.33
80 - 83	B	3.00
77 - 79	B-	2.67
74 - 76	C+	2.33
70 - 73	C	2.00
68 - 69	C-	1.67
65 - 67	D+	1.33
62 - 64	D	1.00
59 - 61	D-	0.67
0 - 59	E	0.00

More information on UF grading policy may be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Students Requiring Accommodations
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter to present to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. A violation of the honor code will result in academic sanctions (typically a failing grade assigned for the course) and further disciplinary action. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use and Copyrighted Material
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use and the use of copyrighted material. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.

***Course Outline*:** The course will cover the following general topics:

Part 1	Modeling, Computers, and Error Analysis
	Mathematical Modeling
	Numerical Methods & Problem Solving
	Numerical Differentiation
	Roundoff and Truncation Errors
Part 2	Root Finding
	Roots: Bracketing Methods
	Roots: Open Methods
Part 3	Linear Algebraic Equations and Matrices
	Linear Algebraic Equations and Matrices
	Gauss Elimination
	LU Factorization
	Matrix Inverse and Condition
	Iterative Methods
Part 4	Curve Fitting
	Linear Regression
	General Linear Least-Squares and non-linear Regression
	Polynomial Interpolation
	Splines and Piecewise Interpolation
Part 5	Numerical Integration
	Numerical Integration based on given data
	Numerical Integration based on given Functions
Part 6	Fourier Analyses
	Fourier Series
	Fourier Integral
	Fourier Transformation
Part 7	Ordinary Differential Equations
	Initial Value Problems
	Adaptive Methods and Stiff Systems