

Course Syllabus

School of Engineering and Technology
Western Carolina University

Course: Engineering Numerical Analysis, ENGR 411	Instructor: Dr. Oai Ha
Term: Fall 2017	Phone: (828) 227-2438
Class time: Tues. and Thur. 2:00-3:15pm	Email: otha@wcu.edu
Class location: Belk 304	Web: http://paws.wcu.edu/otha/
Course webpage: Check your Blackboard	Office loc. & hours: Belk 231, TR 9:00-11:00am Other times by appointments

I. Course Description

Development of numerical algorithms to provide solutions to common problems formulated in engineering and the applicability and limits of the appropriate use.

II. Student Learning Outcomes:

At the end of the semester, students will be able to:

- understand numerical algorithms so that computer programs of their choice (for example, MatLab) can be implemented.
- determine roots of equations numerically
- use numerical methods to solve a system of linear of equations
- understand interpolation and polynomial approximation
- use methods of curve fitting
- solve differential equations using appropriate numerical methods
- evaluate derivatives using finite-difference approximation
- approximate numerically the definite integrals by using the basic algorithms

This course contributes to the achievement of the following student outcomes for the BSE program:

- an ability to apply knowledge of mathematics, basic science and engineering science
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

III. Prerequisites

- MATH 256 Calculus II and EE 220 Computer Utilization
- MATH 320 Differential Equations (highly recommended)

IV. Course Text

Singiresu S. Rao (2013). Applied Numerical Methods for Engineers and Scientists 2002, Prentice Hall. (available at WCU bookstore as a book rental).

Reference material:

Applied Numerical Analysis Using MATLAB (2nd ed.) by Laurene V. Faucett, ISBN-13: 978-0132397285

V. Evaluation

Assignments

- Homework will be given to reinforce the learning of information presented in lectures
- You will be given approximately two weeks to complete each assignment

Project

- You will be assigned two projects. You will be given approximately three weeks to complete the first project and approximately six weeks to complete the second project.
- For the first project, you will be expected to write a report in addition your code and set of equations. For the second project, you will be expected to provide a progress report, a final report, and a presentation.
- For both projects, you will be evaluated on your writing, accuracy, and how well you have achieved the overall objective of the project.

Exams

- Exam 1 will be an in-class exam and will be on all topics covered prior to the set date with exception to interpolation.
- Exam 2 will be a take home exam and will be on all topics covered prior to the set date with exceptions to topics covered by exam 1 and Ordinary Differential Equations.
- The Final Exam will be comprehensive and will include all information presented in the course.

Evaluation

Homework Assignments	15%
Project I	10%
Project II	15%
Midterms (2)	30%
<u>Final Exam</u>	<u>30%</u>
	100%

Grading Scale:

The grading scale below will be used to determine final grades:

98-100	A+	78 – 79	C+	0 – 59	F
92 – 97	A	72 – 77	C		
90 – 91	A-	70 – 71	C-		
88 – 89	B+	68 – 69	D+		
82 – 87	B	62 – 67	D		
80 – 81	B-	60 – 61	D-		

Note:

- 1) Grade cutoff points may be lowered at the discretion of the instructor.
- 2) Scores and grades are only an indication of what you perform in this course, not who you are.

Course Evaluation Dates: November 13 – December 10, 2017

Students are strongly encouraged to participate in online course evaluations (CoursEval).

VI. Faculty Expectations of Students and Course Policies

Academic Honesty Policy: Students, faculty, staff, and administrators of Western Carolina University (WCU) strive to achieve the highest standards of scholarship and integrity. Any violation of the Academic Integrity Policy is a serious offense because it threatens the quality of scholarship and undermines the integrity of the community. While academic in scope, any violation of this policy is by nature, a violation of the Code of Student Conduct and will follow the same conduct process (see Article VII.B.1.a.). If the charge occurs close to the end of an academic semester or term or in the event of the reasonable need of either party for additional time to gather information timelines may be extended at the discretion of the Department of Student Community Ethics (DSCE).

Violations of the Academic Integrity Policy include:

- Cheating - Using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
- Fabrication - Creating and/or falsifying information or citation in any academic exercise.

- Plagiarism - Representing the words or ideas of someone else as one's own in any academic exercise.
- Facilitation - Helping or attempting to help someone to commit a violation of the Academic Integrity Policy in any academic exercise (e.g. allowing another to copy information during an examination)

Your own course work from another class may be used, but this must also be cited and not presented as original work developed during the course. Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his department head, and the Associate Dean of the Graduate School when the student is a graduate student, in writing of the academic dishonesty charge and sanction. See the Student Handbook for information about the process.

Attendance Policy: Research has shown that there is a direct correlation between class attendance and final grades. Your attendance and active participation is crucial to this class; therefore, you are expected to attend class each time it meets. However, it is understood that occasions do arise that might prevent the student from attending class.

Excused absences are defined as those that were approved by the professor prior to the absence or there is sufficient documentation justifying an excused absence. Excused absences have no effect on the course grade if missed work is completed in a timely manner. Documentation for excused absences must be presented to the professor in a timely manner and on your own initiative. If an excused absence results in a single missed exam, the grade for this missed exam will be the final exam grade. If two or more exams are missed, a grade of zero will be given for each exam, even if it is excused.

Unexcused absences: Work not submitted in time due to an unexcused absence may be rejected and a grade of zero recorded for the assignment. If the work is accepted by the professor, the graded assignment will be reduced by one letter grade for each day late. If an exam is missed due to an unexcused absence a grade of zero will be recorded for the exam.

Students are expected to complete all assignments and exams when scheduled. Students who are sick or otherwise unable to attend class on the day an assignment is due are encouraged have their completed assignment delivered to the class (physically or electronically). When you are absent, it is your responsibility to obtain the material missed.

Accommodations for Students with Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities and/or medical conditions. Students who require accommodations must identify themselves as having a disability and/or medical condition and provide current diagnostic documentation to the Office of Disability Services. Please contact the Office of Disability Services, 135 Killian Annex (next to the One Stop), (828) 227-3886 or by email at disabilityservices@wcu.edu.

General Policies:

- No tobacco use will be allowed in the class room.
- Food and drinks are not permitted within the classroom or laboratory at any time.
- No one will be permitted to leave class during exams. If you have an emergency, please notify the professor.
- Cell phones should be in silent mode or powered off during lecture.
- Students who interfere, disrupt, or take away from the higher learning environment (talking, noise-making, disturbing others, etc.) will be reprimanded and/or ask to leave class for that day, and/or expelled from class with a final grade of "F".
- Special need students. Students should notify the professor and show documentation of need for Student Support Services during the first week of class.

ENGR 411 Course Schedule (Fall 2017)

Dates	Topic
Aug 22	Course Introduction Pre-Assessment (Ordinary Differential Equations, Partial Differential Equations, Linear Algebra)
Aug 24, 29	MATLAB – Basics MATLAB -- Programming
Aug. 31, Sept. 5, 7	Root of Equations – Bracketing method Roots of Equations – Open Method Roots of Equations-Roots of Polynomials Homework 1 is due (September 7) <i>MATLAB Programming</i>
Sept. 12, 14	Gauss Elimination LU Decomposition and Matrix Inversion Homework 2 is due (September 14)
Sept. 19, 21	Gauss-Seidel Curve Fitting
Sept. 26, 28	Least-Squares Regressions (Linear) Least Squares Regressions (Nonlinear) Homework 3 is due (September 28)
Oct. 2	Interpolation (1) Project I Description
Oct. 5	Exam I (All topics with exception to Interpolation)
Oct. 10, 12	Interpolation (2) Numerical Differentiation Brief Review of Midterm Exam Homework 4 is due (October 12)
Oct. 17, 19	No classes, Fall Break
Oct. 24, 26	Numerical Integration (Newton Cotes) Numerical Integration and Differentiation Case Study Project I Due (Oct. 24) Project II Description
Oct. 31	Selection of Topic for Project II due (submit through Blackboard) No Classes, Advising Day
Nov. 2	Integration of Equations
Nov. 7, 9	ODEs-Euler's Method ODEs-Runge Kutta Method Homework 5 is due (November 9)
Nov. 14 and 16	Progress Report due Take Home Midterm Exam (Nov. 12-14) (All topics after Exam I with exception to ODE) ODE Boundary Value Problems
Nov. 21	ODE Case Study
Nov. 23	No Classes, Thanksgiving
Nov. 28, 30	PDE-Finite Difference-Elliptic Equations PDE-Finite Difference –Parabolic Equations
Dec. 5	PDE-Finite Element*
Dec. 7	Presentations Questions for Final Exam Written reports due electronically by 5pm (Dec. 9 th)
Dec. 11	Final Exam (12-2:30pm)

Note: This schedule and its contents are subject to change at the discretion of the instructor.