

**Mechanical Engineering 3001-001 – Mechanical Engineering Analysis**

**Spring 2020 Syllabus**

**Tennessee Technological University - College of Engineering**

**Class Time:** MWF 2:30 – 3:25 p.m.

**Location:** Prescott Hall 215

**Instructor:** Dr. Will Brookshear

Office: Brown Hall 110

Office Hours: Tuesdays and Thursdays - 12:00 p.m. – 2:00 p.m. (or by appointment)

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**Textbook:** Scientific Computing with MATLAB and Octave, Fourth Edition by Alfio Quarteroni, Fausto Saleri, and Paola Gervasio

**Prerequisites:** ENGR 1120, MATH 2010 and MATH 2120

**Course description:** The goal of this course is to develop and implement analytical and numerical techniques for typical mechanical engineering problems and applications in various topics using the MATLAB programming language.

**Course Objectives/Student Learning Outcomes:**Practical methods for solving engineering applications in the areas of dynamics, mechanics, heat transfer, and fluids will be investigated with modern numerical computing tools such as the MATLAB programming language. Analytical and numerical methods for computation and engineering problem solving will include:

• Root Finding and Solutions to Non-Linear Equations

• Systems of Linear Equations

• The Eigenvalue Problem

• Theoretical Solutions to Ordinary Differential Equations

• Numerical Solutions to Ordinary Differential Equations

• Laplace Transforms

• The Fourier Series

• Theoretical Solutions to Partial Differential Equations

• Numerical Solutions to Partial Differential Equations

**Primary Teaching Methods:** Lecture, in-class problems and discussion, weekly quizzes, MATLAB homeworks, project

**Special Instructional platform/materials:** Online iLearn platform, MATLAB

**Academic Misconduct:** All work submitted for credit in this course must be your own. For assignments in which you are a member of a group, this means you are required to actively participate and contribute as a group member. The sharing of code and/or files is strictly forbidden. In addition, the use of disallowed materials and/or devices during in-class activities and exams will result in the appropriate punishment. The College of Engineering subscribes to and enforces the TTU policy on student academic misconduct; refer to:

[https://tntech.policytech.com/dotNet/documents/?docid=701&mod e=view](https://tntech.policytech.com/dotNet/documents/?docid=701&mod%20e=view).

This policy prohibits plagiarism, cheating, and all other forms of academic dishonesty. Students guilty of misconduct either directly or indirectly through participation or assistance are immediately responsible to the instructor of the class. The instructor has the authority to assign appropriate penalties including an "F" (no credit) for the assignment involved or an "F" (failing grade) for the course. The instructor, after informing the student of the charge of academic misconduct and of his/her right to a hearing, will send a copy of the charge to the student, the Department Chair, the Dean, the Provost’s Office and the Office of the Registrar within five business days of the instructor’s determination that academic misconduct has occurred.

**Disability Services:** Students with disability requiring accommodations should contact the Office of Disability Services (ODS). An Academic Adjustment Form should be completed as soon as possible, preferably by the end of the first week of the course. The ODS is located in the Roaden University Center, Room 112, phone 372-6119.

**Classroom Conduct:** My goal is to foster an open environment of mutual respect. This is a college course and the expectation is that students will behave as adults who are seeking an education to pursue a professional career. I will treat you according to that belief and I expect you to act in a similarly professional manner. I encourage open discussion in the classroom, but I will not tolerate rude or disrespectful actions or remarks.

Unacceptable actions include sleeping, talking to other students, tardiness, leaving class early, monopolizing classroom time, being blatantly disrespectful of the professor or other students, use of tobacco products, and doing unrelated homework in this class.

Laptops are allowed for the purpose of taking notes, but any activity unrelated to what is occurring in the classroom is not allowed.

The use of phones or other smart devices in class is prohibited. These devices must be silenced and put away while in the classroom.

Failure to adhere to these policies will result in removal from the classroom and an appropriate penalty on your overall grade.

**Course Grading:**

Weekly Quizzes: 100 points

MATLAB Homeworks: 150 points

Group Project: 150 points

Exam 1: 200 points

Exam 2: 200 points

Final Exam: 200 points

Total: 1000 points

Grades for each assignment (MATLAB homeworks, projects, weekly quizzes, exams) will be posted on iLearn as soon as they are complete, and you should check your grades periodically. If you believe a grade is incorrect or missing, please let me know via email as soon as possible. Two weeks after a grade has been posted it will be considered final.

Late homework assignments will be penalized twenty points per day (homework submitted after the specified time on the given due date is automatically treated as being one day late).

If you miss an exam or weekly quiz you will not be allowed a make-up opportunity without verifiable documentation of a valid excuse.

**Grade Scale:**

A: 900-1000 points

B: 800-899 points

C: 700-799 points

D: 600-699 points  
F: 599 points and below

**MATLAB Homework Assignments:** Homework assignments involving problem solving with MATLAB will be given throughout the semester, and detailed instructions for each assignment will be posted on iLearn. Your homework submissions must follow these detailed instructions and should be submitted digitally, although printed copies may be required under certain circumstances. Any software or code used to complete your homework must be properly documented and submitted. For MATLAB homework assignments you must work with a partner in a group of two, but groups exceeding two members are strictly disallowed unless you receive direct permission from the instructor. Group submissions should only consist of a single copy of the completed assignment, but the name of both group members must be included on all submitted files.

**Weekly Quizzes:** We will have a weekly quiz on Wednesday of each week (potentially excluding exam weeks). These quizzes are designed to require approximately 30 minutes and must be submitted by 11:59 p.m. Wednesday night. You will be given time to start the quiz at the end of class on Wednesday, and you are welcome to ask questions and work with a partner, but each student must submit a PDF of their quiz solution to the appropriate iLearn drop box. The goal of these quizzes is to help you stay up to date with the current material and to help prepare you for exams.

**Exams:** There will be two midterm exams and a final exam. The midterm exams will be announced at least one week ahead of time. The final exam is scheduled for 1:00 – 3:00 p.m. on Thursday, May 7th as listed on the official Tennessee Tech University Spring 2020 Exam Schedule.

**Group Project:** A group project requiring you to develop a mathematical model for a mechanical system will be a semester long project. This project will focus on enhancing both the mathematical and programming skills you develop during the course.

**In-class Problems:** During class we will work example problems, and I will give you time to work through the examples before I go over them. I encourage you to take advantage of these opportunities to work through the problems yourself to enhance your understanding. During these in-class problems you are welcome to discuss the approach with the students around you as the objective is to create a classroom environment that fosters and engaged and shared learning experience.

**Attendance Policy and Class Participation**: As a student pursuing a professional career, you are expected to attend lecture, and attendance will be taken during each class. You are encouraged to actively participate in class discussions, and you should not feel afraid to ask questions. The purpose of going to class is to learn, and asking questions is a critical part of that process. If you have questions that you feel do not fit within the time limit of lecture, please feel free to seek me out in my office or contact me via email.

**Lecture Slides:** I will post the basic slides from lecture to iLearn. However, any additional content added during class (such as working through examples by hand) will not be included in order to encourage you to actively stay alert and attentive during class.

**Tentative Schedule:** Still working on this, but I’ll have it together before the first day of classes.