ENGR 5 – Programming and Problem Solving in MATLAB

Section #51070

Class:
Class meetings on Mondays/Wednesdays, 12:00-2:15pm, PHY-77
All class materials posted on Canvas

Instructor:
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MWF, 11:00-11:50am
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If you cannot make regular office hours, feel free to make an appointment.

Welcome to ENGR 5! In this course, you will learn how to use the MATLAB programming environment and applying it towards solving engineering problems. Many previous students have told me that they wish that they had learned MATLAB before transferring. So, this is a great opportunity to learn an important skill!

Prerequisites: MATH 5A

Catalog Description: This course utilizes the MATLAB environment to provide students with a working knowledge of computer-based problem-solving methods relevant to science and engineering. It introduces the fundamentals of procedural and object-oriented programming, numerical analysis, and data structures. Examples and assignments in the course are drawn from practical applications in engineering, physics, and mathematics.

Textbook: **MATLAB for Engineering Applications**, 4th Edition, William J. Palm III, McGraw Hill

<u>YOU DO NOT NEED TO PURCHASE THIS TEXTBOOK.</u> **IT IS AVAILABLE FOR A FREE SEMESTER-LONG CHECKOUT FROM THE REEDLEY COLLEGE LIBRARY. JUST ASK AT THE FRONT DESK.**

Student Access to Software:
You will be added to the college's MATLAB license. This will give you access to MATLAB Online and to download the software onto your own computer.

Grading: Grades will be based on the percentage of possible points earned from in-class labs, quizzes, tests, and projects.

In-Class Labs: During most class meetings, we will work on programming activities with MATLAB. These are very important and so they count for a substantial portion of the grade. There will be a number of programs and/or activities assigned at each of our class meetings. Typically, assignments from a Monday meeting will be due by Wednesday night, and assignments from a Wednesday meeting will be due by Friday night.

Lab Corrections: Since the programming skills are so important, you will have the opportunity to make corrections if you do not get a program correct the first time. If you do not receive full credit on a lab activity, **you may resubmit your work with your corrections to gain the full points**. The final day for corrections is set as two weeks after the initial assignment due date.

Tests: There will be three tests (each covering several chapters) throughout the semester. These tests may involve both written work and MATLAB programming.

Projects: More extensive programming assignments will be given as projects. These are opportunities for you to show your programming and problem-solving skills.

Grading Scale:

The overall grade will be based on the overall percentage of possible points that you earn from the labs, quizzes, tests, and projects.

90-100%	A
80-89.9%	B
70-79.9%	C
60-69.9%	D
<60%	F

Accommodations for Students with Disabilities:
If you have a verified need for an academic accommodation or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact me as soon as possible.

Add Date:	Friday, August 25	Last day to add a course
Drop Date:	Friday, October 6	Last day to drop this course
Holidays:	Monday, September 4	Labor Day
	Friday, November 10	Veterans' Day
	Thursday-Friday, November 23-24	Thanksgiving Holiday
Final:	Wednesday, December 6, 12:00-1:50pm	

Student Learning Outcomes:

Upon completion of this course, students will be able to:

1. Apply a top-down design methodology to develop computer algorithms.
2. Create, test and debug sequential MATLAB programs, as well as programs that use object-oriented techniques, in order to achieve computational objectives.
3. Apply numeric techniques and computer simulations to analyze and solve engineering-related problems.
4. Use MATLAB effectively to analyze and visualize data.
5. Demonstrate understanding and use of standard data structures.

Objectives:

In the process of completing this course, students will:

1. Use variables, expressions, and order of operation in MATLAB programs.
2. Use elementary functions in MATLAB programs.
3. Use arrays in MATLAB programs.
4. Learn to design and apply computational problem-solving methodology.
5. Use pseudocode, flowcharts, and documentation to explain the logic of programs.
6. Design programs that use formatted input and output.
7. Design programs that interact with external data files.
8. Use a MATLAB program to plot data.
9. Design programs that use selection programming structures.
10. Design programs that use repetition programming structures.
11. Use intrinsic MATLAB functions and user-defined functions in programs.
12. Design functions that use recursion.
13. Use standard data structures in programs.
14. Design and use sorting and searching algorithms.
15. Write programs that use object-oriented programming concepts.
16. Write programs that solve problems using the following numerical analysis techniques: a. Solving systems of linear equations b. Vector analysis c. Data interpolation d. Least-squares regression and linearization e. Numerical differentiation and integration f. Solving ordinary differential equations g. Series approximation and error h. Solving equations of one variable.

Course Schedule (Subject to change)

Week 1	Chapter 1: MATLAB Interface, Arrays, Scripts, Plotting, Input/Output
Week 2	Chapter 2: 2D Arrays, Analyzing Data, Array Operations
Week 3	Chapter 2: Polynomial Arrays, Practice
Week 4	Chapter 3: Functions: Creating, Calling, Arrays and Functions, Pseudocode, **Assign Project #1**
Week 5	Chapter 3: Reading and Writing to Files
Week 6	Review and Chapter 4: Logical Class, Relational Operators
Week 7	**Test #1** (Chapters 1-3) and Chapter 4: If/else, Switch
Week 8	Chapter 4: For and While Loops, Practice, Pseudocode
Week 9	Chapter 5: Plotting, 3D Plots
Week 10	Chapter 6: Fitting Data to a Function, Practice, **Assign Project #2**
Week 11	Chapter 7: Interpolation, **Test #2** (Chapters 4-6)
Week 12	Chapter 8: Systems of Equations, Types of Solutions, Applications
Week 13	Chapter 9: Integrals, Applications
Week 14	Chapter 9: Differentiation, Differential Equations, Applications
Week 15	Practice and Object Oriented Programming (OOP) (Not in Textbook), **Assign Project #3**
Week 16	Object Oriented Programming and Practice, Pseudocode
Week 17	General Practice, Project Presentations
Week 18	**Test #3** (Chapters 7-9, OOP)