ESC 152: Programming with MATLAB
Spring 2021
This course is offered in a remote format and will meet virtually during all scheduled days and time.
Section 1: MWF 12:25 – 1:15
Section 2: MWF 2:35 – 3:25

Required course

Catalog Description: ESC 152 Programming with Matlab (3 credits)
Prerequisites: MTH 168 or equivalent. Prerequisite or co-requisite: MTH 181.
Fundamentals of scientific and engineering problem-solving using computers. Covers the MATLAB language and concepts of accuracy and efficiency in programming solutions to engineering problems.

Textbook: Gilat, A., " MATLAB. An Introduction with Applications", 6th Ed., Wiley (2016) or any earlier edition.

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Remote office hours via Zoom: MW 4 – 5 (or by appointment)

Course Objectives: This course is designed to:
1. Provide students with a basic understanding of programming concepts: Input/output, sequential programming, repetition, branching, modules.
2. Provide students with the skills to formulate an engineering problem and to develop a logical and efficient algorithm for numerical solutions.
3. Develop skills necessary to structure, implement, and debug computer programs.
4. Demonstrate programming skills using the MATLAB language.

Expected Outcomes: Upon completion of this course, students should be able to:
1. Identify, formulate, and solve engineering problems using the MATLAB language.
2. Use techniques, skills, and tools the MATLAB language offers for modern engineering practice.

Fulfills Program Outcomes:
1. An ability to identify and solve complex engineering problems by applying principles of engineering, science, and mathematics.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Prerequisites by Topic:
Calculus.

Items covered:
The course must cover 4 items, necessary and sufficient for any computer language:
1) Input/output
2) Sequential programming
3) Selection
4) Repetition

Specific Topics and Schedule (tentative, earlier textbook editions in [ ]):

Starting with MATLAB (Chapter 1)	2 weeks
Script Files (Chapter 4)	2 weeks
Creating Arrays (Chapter 2)	2 weeks
Mathematical Operations with Arrays (Chapter 3)	2 weeks
Two-Dimensional Plots (Chapter 5)	2 weeks
Functions and Function Files (Chapter 7 [6])	2 weeks
Programming in MATLAB (Chapter 6 [7])	2 weeks
Applications in Numerical Analysis (Chapter 9 [10])	1 week

Organization:

The course requires lectures **L** (theory, logic, syntax). A set of PPT slides are presented in staggered form and made available to the students in unstaggered form after delivery.

The course also requires exercises **E** (fully understand the problem, decide on an algorithm, code algorithm in MatLab, debug if necessary). A set of about 10 exercises are typically chosen to reflect the diversity in majors of the students. I usually terminate exercises if most students appear to have mastered the problem at hand. Therefore, the sequence **LLLEELLEEE**… is dynamic.

For assessment of theoretical understanding, I proctor 3 quizzes **Q** (true/false). For assessment of learned skills, I proctor 3 recitations **R** (design a functioning code based on exercises). These **Q**'s and **R**'s are announced and scattered throughout the above sequence. Occasionally, a project **P** is given as a take-home task.

If all goes well, a semester allows for about 45 meetings. Besides the lecture notes (continuously updated PPT's), I provide the students also with a continuously updated so-called "log-file", which contains a detailed outline of what happened in what meeting. Since the course is dynamic, I also include a schedule for the projected near foreseeable future. Therefore, students are informed about the past and the projected near future at all times. Roughly, the course is partitioned as: 40% **L** (18), 50% **E** (21), 10% **Q**+**R** (6).

Organization for remote emergency version in this particular Spring 2021 semester:

Prerequisites for students: Decent computer with (free) MatLab and (free) Zoom installed and a functioning internet access.

The emulation of a face-to-face course (presented above) remotely poses no serious problem for the **L** and **Q** parts of the course. Lectures **L** are delivered as narrated staggered PPT's using the Panopto function of Blackboard. Students will have access to those presentations starting at class time. All presentations will remain accessible in Blackboard throughout the semester for reference. Unstaggered slides are additionally made available after delivery so that all students have the complete set of lecture notes at the end of the course.

Quizzes **Q** and recitations **R** are proctored using specific functions of Blackboard.

For the exercise **E** part of the course I will enforce group forming of 4 students each (to be announced). These groups are encouraged to exercise together. The interactions of these groups with several advisors (instructor and TA's) will be through "Breakout Rooms" in Zoom.

Remaining Q&A sessions would be covered by usual Zoom office hours. I request my TA's to hold office hours different from my own. It will therefore be arranged that one instructor is available to any student every day a week.

Grading:

Homework may be assigned, can be discussed during office hours, but will not be graded.

Quizzes: 30% (lowest score forgiven)
Recitations: 30% (lowest score forgiven)
Project: 10%
Final: 30%

Incentive:

Students may choose to be exempt from the final if all of the following conditions are met:
- All quizzes are completed (successfully or not).
- Excluding the lowest score, the average of the quiz scores corresponds to a letter grade of A- or better.
- All recitations are completed (successfully or not).
- Excluding the lowest score, the average of the recitation scores corresponds to a letter grade of A- or better.

Students who are exempt from taking the final will have their quiz average awarded as their final exam grade. Then the above weighting applies. If students who are exempt from taking the final choose to take it, their final exam grade will be either their quiz average or the grade they scored in their final exam, which ever is greater. Then the above weighting applies. Schedules for the quizzes, recitations, and the project will be determined as the course proceeds.

Grade	Score
A	100 - 95
A-	94 - 90
B+	89 - 87
B	86 - 83
B-	82 - 80
C+	79 - 75
C	74 - 70
D	69 - 60
F	59 - 0

Prepared by: Rolf Lustig, January 2021