MATH 165: Introduction to Programming and Problem Solving

Adopted in Fall 2022 (Committee: Drs. Leem, Liu, Pelekanos)

Course Description

This course will introduce first-year or second-year *Math major students* to real-world problem solving using a modern computational environment MATLAB. In the context of engineering applications, basic procedural programming concepts will be covered including input/output, branching, looping, functions, file input/output, and data structures such as arrays and structures. Moreover, basic R programming concepts will also be covered. Additionally, the course will introduce simple numerical methods, such as curve fitting. Homework assignments will be given weekly, and the lab activities will be led by a TA or an instructor during the weekly lab sessions.

Prerequisite: MATH 150, assuming no knowledge of programming.

Course Objectives

This course is designed to train and develop students' skills, and knowledge in:

- basic procedural programming concepts with MATLAB
- basic R programming concepts used in Statistics
- the use of the modern computational environment MATLAB
- writing efficient, reusable, and readable computer codes
- basic problem solving and mathematical modeling skills
- experience in designing a solution to a real-world problem
- document and explain solutions to technical engineering problems

Textbook

"MATLAB: A Practical Introduction to Programming and Problem Solving, 5th Edition" by Stormy Attaway, © 2018 Elsevier, Inc. ISBN: 9780128154793.

MATH 165: Introduction to Programming and Problem Solving

Course Outline (cover ~2 sections each lecture, skip Chap 11, 13)

Week	Sections to be covered	Remarks
1	Chap 1, Introduction to MATLAB M: Sec 1.1-1.2; W: Sec 1.3-1.4; F: Lab Session	**Free Octave** may be used
2	Chap 1, Introduction to MATLAB M: Sec 1.5-1.6; W: Sec 1.8; F: Lab Session	Skip Sec 1.7,1.9
3	Chap 2, Vectors and Matrices M: Sec 2.1-2.2; W: Sec 2.3-2.4; F: Lab Session	Skip Sec 2.5
4	Chap 3, Introduction to MATLAB Programming M: Sec 3.1-3.4; W: Sec 3.5-3.7; F: Lab Session	
5	Chap 4, Selection Statements M: Sec 4.1-4.2; W: Sec 4.3-4.5; F: Lab Session	
6	Chap 5, Loop Statements and Vectorizing Code M: Sec 5.1-5.3; W: Sec 5.4-5.5; F: Exam 1*	**Exam/Project 1**
7	Chap 6, MATLAB Programs M: Sec 6.1-6.2; W: Sec 6.3-6.4; F: Lab Session	Skip Sec 6.5, 6.6 add 6.5.3 Debug Techniques
8	*Chap 7, String Manipulation @ (optional)* M: Sec 7.1-7.2; W: Sec 7.3-7.4; F: Lab Session	
9	Chap 8, Data Structures M: Sec 8.1-8.2; W: Sec 8.3-8.4; F: Lab Session	Skip Sec 8.5
10	Chap 9, Data Transfer M: Sec 9.1-9.2; W: Sec 9.3; F: Lab Session	
11	Chap 10, Advanced Functions M: Sec 10.1-10.2; W: Sec 10.3-10.4; F: Lab Session	Skip Sec 10.5
12	Chap 12, Advanced Plotting Techniques M: Sec 12.1-12.2; W: Sec 12.3-12.5; F: Exam 2*	**Exam/Project 2**
13	Chap 14, Advanced Mathematics M: Sec 14.1-14.3; W: Sec 14.4-14.5; F: Lab Session	Skip Sec 14.4 *add Newton's method
14	Introduction to R programming # M: R tutorial; W: R tutorial; F: R Lab	
15	Introduction to R programming # M: R tutorial; W: R tutorial; F: R Lab	
16	**Final Exam/Project ***	

@ Chap 7 is optional, if the instructor would like to slow the progress a little bit.
# http://mathesaurus.sourceforge.net/octave-r.html (R for MATLAB users).
# https://www.cyclismo.org/tutorial/R/ (R Tutorial Website).
# http://siue.edu/~jpailde/Intro_to_R_Sum16.pdf (Dr. Pailden's lecture slide).
* Exams should include coding problems with blanks to fill in.