Engineering 7
Introduction to Computer Programming for Scientists and Engineers

Lecture Times: Monday and Wednesday, 2-3 pm, Dwinelle Hall 155

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Office Hours: Monday & Wednesday 3-4pm at Dwinelle Hall 155 (after lecture) or by appointment

Head GSI:
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Course Material:
Recommended Text: An Introduction to MATLAB Programming and Numerical Methods for Engineers, Siauw & Bayen. The textbook is available in the campus bookstore.

Recommended Software: You will have access to the latest version of MATLAB in the lab sections (see lab information below for information). You may also install your own copy if you wish to be able to work on your personal computer. The latest version of MATLAB (2019a or 2018b) is provided free of cost to you by the university. For installation instructions, please see this link: https://software.berkeley.edu/matlab.

I. Course Objectives

E7 is an introductory course on computer programming for lower-division students in science and engineering. The principal goal of the course is to teach basic computer programming concepts and apply them to computer-based problem-solving methods. The course stresses hands-on computer programming using MATLAB, a powerful high-level programming environment.

The prerequisite for this course is Math 1B, which may be taken concurrently.

II. Course Format

Each E7 student will attend two hours of lecture, four hours of computer laboratory, and one hour of discussion per week. Professor Sengupta will teach the lectures, while the GSI staff lead labs and discussions.

Lab sections will begin in the second week of instruction (Monday, January 28), while Discussion sections will begin in the first week of instruction (Friday, January 25). You should only attend the lab and discussion section in which you are officially enrolled.

III. Course Website

The course website is hosted at bcourses.berkeley.edu. The E7 bcourses site is where you can access course announcements, homework assignments, grades, and other documents pertaining to course material. You will also be required to upload your homework assignments only via bcourses. Additionally, you will have access to a discussion forum (Piazza) where you can communicate with the instructor, GSI's, and fellow classmates about technical questions in the coursework. While you may post questions about the course material, under no circumstances may you post code or copy another student's work.

Violations of the honor code will be severely punished. It is your responsibility to check the website frequently, as important information about the course will be routinely posted without being announced in lecture.

We also have Piazza. This is intended for any student to ask questions regarding course material and difficulties in doing the assignments. The GSI team will be online 9am-9pm, Monday to Friday. The signup can be done through this link: piazza.com/berkeley/spring2019/e7.

IV. Grading and Examinations

The course grade will be assigned based on the following percentages:

50% Homework Assignments
12.5% Midterm 1 (Wednesday, March 6, 2-3 PM – Lecture Time) Room: TBD
12.5% Midterm 2 (Wednesday, April 17, 2-3 PM – Lecture Time) Room: TBD
25% Final Examination (Exam Group 6: 11:30-2:30 PM, Tuesday, May 14) Room: TBD

Homeworks will be returned to you typically via bcourses. If you feel that a problem was graded incorrectly, you may submit a re-grade request within one week of receiving the graded assignment. To do this, you must first consult with your Lab GSI and if approved, the Lab GSI would write a short paragraph on the grading error and submit it to the class email for evaluation. **Please note that your entire assignment may be re-graded, not only the sections you question.**

Midterms will be held during lecture times, with rooms to be announced as the midterm draws nearer. If you are a DSP student and require accommodations for the exam, please notify the instructor and Head GSI within the first three weeks of class so that we can provide the necessary accommodations for you. Attendance at all examinations is mandatory unless cleared in advance with the professor and Head GSI.

V. Assignments

There will be 10 assignments, posted on Fridays of each week. Your lowest score on any individual assignment will be dropped. Assignments must be turned in on bcourses no later than 11.59 pm (slightly before midnight) on Friday of the week they are due. **No late assignments will be accepted.**

We recognize the possibility of a student doing badly on two or more assignments due to circumstances beyond their control or extraordinary commitments to the university. We will consider such situations when assigning the final grade. To receive this consideration:

- submit documentation establishing that the absence or late submission is due to an unfortunate circumstance or extraordinary commitment to the university, and
- submit the late work as soon as possible by email before its solution is posted, to the class email e7.berkeley@gmail.com, with heading: "Late Submission – Assignment XX".

Your case will be put on our record and considered when assigning your final grade. Note to receive this consideration for a late assignment you must submit your work before its solution is posted. Solutions will be posted on the Wednesdays morning after the assignment is due.

Assignments are to be worked on both during lab sections and outside of class. There are precise formatting requirements for submitting assignments that will be explained in the first assignment and in lab section.

You can discuss the assignments with anyone of your choice. **All material submitted must be your own original work. Copying someone else's work or allowing your work to be copied constitutes cheating, and will result in zero credit for the entire assignment, and further disciplinary action as appropriate by university policy.** For further reference, see the Berkeley Campus Code of Student Conduct at: https://sa.berkeley.edu/conduct.

VI. MATLAB

MATLAB, like many languages, has an extensive list of additional functions that have been packaged into sets, called toolboxes (other languages usually call them libraries). Toolboxes are a great resource, since someone has often already made a function that does the task you are trying to do. However, for this class your lab functions will all be tested on an identical environment to the ones provided in Etchevery 1109 and 1111. As such, the autograder will only have access to the toolboxes installed on this system. If your code attempts to use a function in another toolboxes, it will throw an error in the autograder and receive 0 points. A full list of the Matlab system and toolboxes installed on the Etcheverry systems can be found below. You can generate a similar list for your Matlab system by typing "ver" into the command window. We recommend that you either check your code on a lab section computer before submission, or that you remove any additional toolboxes on your system manually going to Home -> Environment -> Manage Add-Ons).

The list of the default toolboxes are as follow:

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MATLAB                                                Version 9.5
Simulink                                              Version 9.2
Aerospace Blockset                                    Version 4.0
Aerospace Toolbox                                     Version 3.0
Antenna Toolbox                                       Version 3.2
Audio System Toolbox                                  Version 1.5
Automated Driving System Toolbox                      Version 1.3
Bioinformatics Toolbox                                Version 4.11
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Communications Toolbox                          Version 7.0
Computer Vision System Toolbox                  Version 8.2
Control System Toolbox                          Version 10.5
Curve Fitting Toolbox                           Version 3.5.8
DSP System Toolbox                              Version 9.7
Database Toolbox                                Version 9.0
Datafeed Toolbox                                Version 5.8
Deep Learning Toolbox                           Version 12.0
Econometrics Toolbox                            Version 5.1
Embedded Coder                                  Version 7.1
Filter Design HDL Coder                         Version 3.1.4
Financial Instruments Toolbox                   Version 2.8
Financial Toolbox                               Version 5.12
Fixed-Point Designer                            Version 6.2
Fuzzy Logic Toolbox                             Version 2.4
GPU Coder                                       Version 1.2
Global Optimization Toolbox                     Version 4.0
HDL Coder                                       Version 3.13
HDL Verifier                                    Version 5.5
Image Acquisition Toolbox                       Version 5.5
Image Processing Toolbox                        Version 10.3
Instrument Control Toolbox                      Version 3.14
LTE HDL Toolbox                                 Version 1.2
LTE Toolbox                                     Version 3.0
MATLAB Coder                                    Version 4.1
MATLAB Compiler                                 Version 7.0
MATLAB Compiler SDK                             Version 6.6
MATLAB Report Generator                         Version 5.5
Mapping Toolbox                                 Version 4.7
Model Predictive Control Toolbox                Version 6.2
Optimization Toolbox                            Version 8.2
Parallel Computing Toolbox                      Version 6.13
Partial Differential Equation Toolbox           Version 3.1
Phased Array System Toolbox                     Version 4.0
Polyspace Bug Finder                            Version 2.6
Polyspace Code Prover                           Version 9.10
Powertrain Blockset                             Version 1.4
Predictive Maintenance Toolbox                  Version 1.1
RF Blockset                                     Version 7.1
RF Toolbox                                      Version 3.5
Risk Management Toolbox                         Version 1.4
Robotics System Toolbox                         Version 2.1
Robust Control Toolbox                          Version 6.5
Signal Processing Toolbox                       Version 8.1
SimBiology                                      Version 5.8.1
SimEvents                                       Version 5.5
Simscape                                        Version 4.5
Simscape Driveline                              Version 2.15
Simscape Electrical                             Version 7.0
Simscape Fluids                                 Version 2.5
Simscape Multibody                              Version 6.0
Simulink 3D Animation                           Version 8.1
Simulink Check                                  Version 4.2
Simulink Code Inspector                         Version 3.3
Simulink Coder                                  Version 9.0
Simulink Control Design                         Version 5.2
Simulink Coverage                               Version 4.2
Simulink Design Optimization                    Version 3.5
Simulink Design Verifier                        Version 4.0
Simulink Report Generator                       Version 5.5
Simulink Requirements                           Version 1.2
Simulink Test                                   Version 2.5
Stateflow                                       Version 9.2
Statistics and Machine Learning Toolbox         Version 11.4
Symbolic Math Toolbox                           Version 8.2
System Identification Toolbox                   Version 9.9
Text Analytics Toolbox                          Version 1.2
Trading Toolbox                                 Version 3.5
Vehicle Dynamics Blockset                       Version 1.1
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Vehicle Network Toolbox                 Version 4.1
Vision HDL Toolbox                      Version 1.7
WLAN Toolbox                            Version 2.0
Wavelet Toolbox                         Version 5.1
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VII. Lab and Course Policies

All students are required to attend only the lab they are officially enrolled in. You can attend a lab different from the one enrolled in only under certain circumstances which have to be discussed with the Head GSI.

No food, drink, or cell phones are permitted in lab. If you choose to receive a call or wish to eat, you should step outside of the lab to do so. We strongly encourage that you bring a removable storage device/flash drive to lab sections to save your work. All data saved to the lab computers will be erased upon logging out, so it is critical that you either back up your work on a flash drive or email your work to yourself. We will give you login information on the first day of E7 lab, which will also be used to keep track of the course printing allocation. **Login information is confidential and should not be shared with students outside E7. If the printing allocation is exceeded, you will be charged to refill it.**

Contact your Lab/Discussion GSIs and the Professor for all questions regarding the course material (lectures, assignments and so on). Contact the Head GSI only for administrative matters that include course conduct, enrollment, grading concerns, examinations and other special accommodations. Please do not expect to get course material or assignment related questions answered by the Head GSI.

VIII. Lab Schedule

Lab starts on the second week commencing on Monday, January 28, 2019.

Section	Times	Location	Instructors
Lab 011	MW 8-10 am	Etcheverry 1109	Chrystal Chern Jessica Richard
Lab 012	MW 10 am - noon	Etcheverry 1109	Jason Scot Simon Wenyu Li
Lab 013	MW noon - 2 pm	Etcheverry 1109	Jessica Richard Morgan Wilder
Lab 014	MW 4-6 pm	Etcheverry 1109	Bryant Gunawan Wenyu Li
Lab 015	TuTh 8-10 am	Etcheverry 1109	Dihan Yang Jason Scot Simon
Lab 016	TuTh 10 am - noon	Etcheverry 1109	Jason Scot Simon Christian Jonathan
Lab 017	TuTh noon - 2 pm	Etcheverry 1109	Christian Jonathan Christina Hyland
Lab 018	TuTh 2-4 pm	Etcheverry 1109	Aurian Durbuis Christina Hyland
Lab 019	TuTh 4-6 pm	Etcheverry 1109	Christina Hyland Aurian Durbuis
Lab 020	TuTh 6-8 pm	Etcheverry 1109	Wenyu Li David Yermian
Lab 021	MW 6-8 pm	Etcheverry 1109	David Yermian Bryant Gunawan
Lab 022	TuTh 11 am - 1 pm	Etcheverry 1111	Morgan Wilder Chrystal Chern
Lab 024	MW 10 am - noon	Etcheverry 1111	Aurian Durbuis Morgan Wilder

VIII. Discussion Schedule

Lab starts on the first week commencing on Friday, January 25, 2019.

Section	Times	Location	Instructor
Dis 101	F 8-9 am	Etcheverry 3108	Tiange (Tina) Li
Dis 102	F 9-10 am	Etcheverry 3108	Tiange (Tina) Li
Dis 103	F 10-11 am	Etcheverry 3108	Tiange (Tina) Li
Dis 104	F 11 am - noon	Etcheverry 3108	Henry Teng
Dis 105	F 1-2 pm	Etcheverry 3108	Henry Teng
Dis 106	F 2-3 pm	Etcheverry 3108	Henry Teng
Dis 107	F 3-4 pm	Etcheverry 3108	Henry Teng
Dis 110	F 2-3 pm	Etcheverry 3106	Tiange (Tina) Li

IX. Lecture Schedule

Content subject to change.
Labs are posted on Fridays.

Class	Date	Day	Subject	
1	Mon	21-Jan	*No Class - Martin Luther King Day*	
	Wed	23-Jan	Course Introduction: how to use computer for engineering problem	
	Fri	25-Jan	Discussion/Lab Intro	Lab 1 assigned
2	Mon	28-Jan	Functions, programing languages, encoders, Turing machine	
3	Wed	30-Jan	Von Neumann architecture and programs, using memory, data types	
	Fri	1-Feb	Discussion/Lab Intro	Lab 1 due, Lab 2 assigned
4	Mon	4-Feb	Data types, memory, type checking, function composition	
5	Wed	6-Feb	Function calls, scope, I/O, iteration	
	Fri	8-Feb	Discussion/Lab Intro	Lab 2 due, Lab 3 assigned
6	Mon	11-Feb	Turing completeness, halting problem, for vs while, recursive functions	
7	Wed	13-Feb	Recursive programs, sets, program tracing, order of recurrence	
	Fri	15-Feb	Discussion/Lab Intro	Lab 3 due, Lab 4 assigned
8	Mon	18-Feb	*No Class - President's Day*	
	Wed Fri	20-Feb	Program specification, functional and imperative programing, induction	
		22-Feb	Discussion/Lab Intro	Lab 4 due, Lab 5 assigned
9	Mon	25-Feb	Floating point numbers	
10	Wed	27-Feb	Computational complexity, Big O notation	
	Fri	1-Mar	Discussion – Midterm 1 Review	Lab 5 due
11	Mon	4-Mar	Midterm 1 Review	
12	Wed	6-Mar	**Midterm 1 (Material up to Lecture 10)**	
	Fri	8-Mar	Discussion	
13	Mon	11-Mar	Linear equations	
14	Wed	13-Mar	Least squares regression	
	Fri	15-Mar	Discussion/Lab Intro	Lab 6 assigned
15	Mon	18-Mar	Curve fitting, interpolation	
16	Wed	20-Mar	Numerical root finding	
	Fri	22-Mar	Discussion/Lab Intro	Lab 6 due, Lab 7 assigned
	Mon	25-Mar	*Spring Break*	
	Wed	27-Mar	*Spring Break*	
	Fri	29-Mar	*Spring Break*	
17	Mon	1-Apr	Numerical differentiation	
18	Wed	3-Apr	Numerical integration	
	Fri	5-Apr	Discussion/Lab Intro	Lab 7 due, Lab 8 assigned
19	Mon	8-Apr	ODE	
20	Wed	10-Apr	Data storage and retrieval, keys and values	
	Fri	12-Apr	Discussion – Midterm 2 Review	Lab 8 due
21	Mon	15-Apr	Midterm 2 Review	
22	Wed	17-Apr	**Midterm 2 (material up to Lecture 19)**	
	Fri	19-Apr	Discussion	Lab 9 assigned
23	Mon	22-Apr	Memory basics, handlers/pointers, call by value/reference	
24	Wed Fri	24-Apr	Memory deallocation, pointer arithmetic, memory safety	
		26-Apr	Discussion/Lab Intro	Lab 9 due, Lab 10 assigned
25	Mon	29-Apr	Data retrieval, memory fragmentation, lists, queues, tree	
26	Wed	1-May	Hash tables and functions	
	Fri	3-May	Discussion – Final Review	Lab 10 due
Week of 6-May to 10-May – Review				