University of California, Berkeley *Department of Mechanical Engineering*
Fall Semester 2016 *Instructors: Professor M.-Reza Alam*

E7 – Introduction to Computer Programming for Scientists and Engineers

1. 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.

2. Course Format

E7 consists of classroom lectures, computer laboratory sections, and classroom discussions. Faculty instructors deliver lectures and discussions, while graduate student instructors (GSIs) supervise laboratory sections.

Lectures begin on **Wednesday August 24th** and are held Mondays and Wednesdays in **105 Stanley Hall**. The lecture time is from 9am to 10am. Discussions begin on **Friday, August 26th,** and will be held in **105 Stanley Hall** every Friday (9am-10am). During the discussion we will cover additional exercises, present and discuss the upcoming homework/laboratory assignments, and answer questions. The first discussion session will introduce the logistics of the course. Laboratory sections begin starting **Monday, August 29th**.

IMPORTANT: To register for E7, you must be enrolled in a laboratory section. Also, you may only attend the laboratory section in which you are officially enrolled.

3. Teaching Staff

Contact information for the course instructor and the Head GSI is given below.

Professor **Reza Alam** (reza.alam@berkeley.edu), 6111 Etcheverry Hall.
Office hours: M10-11, W12-13

Head GSI: **Bo Yang** (yangbo90@berkeley.edu**)** 136 Hesse.
Office hours: Monday 14:00 -15:00 and Tuesday 14:00 - 15:00.

Contact information for other GSIs will be available on the course website (see next section). Administrative and grading matters pertaining to the course should be addressed to the Head GSI.

4. E7 Course Websites

E7 course website at bCourses

The E7 course website is hosted at **bCourses** https://bcourses.berkeley.edu (you can also access this site via calcentral.berkeley.edu). bCourses is UC Berkeley's instructional site (powered by Canvas). There you can

find lecture slides, course announcements, homework and laboratory assignments, lecture notes and other course materials such as sample codes and videos. You are responsible for reviewing and reading announcements, homeworks, assignments, and other course materials.

Each week you will have to download from the E7 course website the laboratory assignment for that week, together with a matlab p-file auto-grader, which you will run to grade your assignment. You will also have to upload your completed assignment and the file generated by the auto-grader, which will contain your grade, to the E7 course website by the assignment due date and time (Fridays at noon). You can upload this file multiple times until the deadline is reached and only your last uploaded file will be preserved.

E7 discussion website at Piazza

We will also set up an E7 discussion website at Piazza (https://piazza.com). The E7 instructors and GSIs strongly encourage you to post technical questions on this site, as opposed to communicating with them by private email. The E7 instructors and GSIs will periodically visit this site and will attempt to respond to questions from students as quickly and accurately as possible.

5. Course Textbook and Programming Language

In E7, you are going to learn Matlab. The E7 Computer Laboratory (1109 Etcheverry) provides computers running Matlab. We highly recommend (but do not require) that you obtain the latest Student Version of Matlab, which can be obtained (free) via UC Berkeley's Software Central.

There is no required textbook for this course. The *recommended* text for this course is *Applied Numerical Methods with Matlab (Custom)* by Steven C. Chapra, 3rd edition McGraw-Hill.

The Matlab application has ample built-in help and tutorials; the same help and tutorials can be also found on the Mathworks web site, along with detailed manuals that you can download for free.

There are many other Matlab textbooks, we suggest exploring the Amazon site for latest editions; you may find there, for instance, a *MATLAB Primer*, Eighth Edition, or *Matlab, Second Edition: A Practical Introduction to Programming and Problem Solving.* You are welcome to ask for the instructor's opinion.

6. Laboratory Assignments

Laboratory Assignments
There will be approximately 12 laboratory assignments (generally due every week). **All assignments must be turned in no later than 12:00 noon on the Friday of the week they are due**. Here is some important information:

(i) The procedure for working on your assignments will be explained during the Discussion Session on Friday, August 26th. Weekly laboratory assignments will be available for download (generally on Thursdays) in the form of a PDF file. You will also have to download an auto-grader Matlab pfile (generally a few days before the assignment due date), which you will have to run after you have completed part or all of your assignment. The auto-grader pfile will grade your work and will generate another file that contains your score, which you will have to upload no later than 12:00 noon on the Friday of the week they are due. You can upload this file multiple times until the deadline and only your last uploaded file will be preserved.

(ii) Owing to the size of the class, late assignments will not be accepted under any circumstances.

(iii) It is acceptable to discuss with your classmates the material contained in the assignments. However, we require that you complete all assignments on your own. **Copying someone else's work or allowing your work to be copied constitutes cheating, and will result in at least zero credit for the entire assignment, as well as possible additional disciplinary action (see the Academic Honesty section below).**

(iv) Open lab times (i.e., not regularly scheduled lab sections) are:

- Monday through Thursday 6–8 pm

- Fridays 8 am – 12 noon and 2–5 pm.

In general, there will be no GSI's present for help during these open lab times.
Computers equipped with MATLAB are also available in other facilities on campus. See http://ets.berkeley.edu/node/3659 for locations and hours.

7. Midterms and Final Examinations

There will be two 50-minute midterm examinations during the Friday discussion times. **The tentative dates for the midterms are respectively October 7 and November 9**. The midterm examinations will take place at the time scheduled for the discussion of your section (i.e., 9-10am). **There will be a 3-hour final examination on Thursday, December 15, 7-10 pm.** You will be required to provide positive ID before entering the examination rooms.

8. Academic Honesty

The student community at UC Berkeley has adopted the following Honor Code: *"As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others."* Your E7 instructors join you in pledging to adhere to this code.

Please note that copying programming code (even if it is only a portion of a larger program) constitutes cheating and we plan to deploy software that will detect when code has been copied. Cheating will result in a 0 on the assignment and a report submitted to The Center for Student Conduct.

9. Grades and Grading

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

40% Homework Assignments
15% Midterm 1
15% Midterm 2
30% Final

If you find any discrepancies between the issued grades and the grades posted on bCourses, please bring them to the attention of one of your laboratory GSIs immediately. Alternatively, you can visit the Head GSI's office hours.

If you feel that a midterm problem is graded incorrectly, write a short paragraph outlining your stance and turn it to your laboratory GSI or the head GSI, along with the original examination. You have one week from the date that exams are first returned to submit a re-grade request. Any re-grades request submitted after the deadline will not be accepted.

10- Tentative Syllabus

Course Introduction
MATLAB as a calculator, scripts and cells and publish
One-dimensional Arrays; Character Strings
Introduction to Functions, User-defined and built-in functions
Function handles, anonymous functions
Subfunctions and nested functions
Two-dimensional arrays; polynomials
Cell Arrays; Structure Arrays
Relational operators; logical operators; conditionals
Definite and Conditional Loops
Debugging, Pseudo code, program representation, UML
Plotting; 3D Plots
Midterm 1 Exam
Linear Algebra (Intro and Matrix Methods)
Linear Algebra
Basic Fitting; Regression
Interpolation, Numerical Differentiation
Computer Representation
Machine precision, numerical error analysis
Induction/Recursion
Induction/Recursion continuation
Solution of non-linear algebraic equations
Statistics (Histograms, Probability, Normal Distribution)
Midterm 2 Exam
Statistics
Numerical Integration
Modeling engineering systems using differential equations
Solutions of Differential Equations
ODE Solvers
Final Examination