

## **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. The faculty instructor delivers lectures and discussions, while graduate student instructors (GSIs) supervise laboratory sections.

Lectures begin on **Wednesday August 28<sup>th</sup>** and are held Mondays and Wednesdays in **155 Dwinelle Hall**. The lecture time is from 9am to 10am. Discussions begin on **Friday, August 30<sup>th</sup>**, and will be held in **155 Dwinelle 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 **Tuesday, September 3<sup>rd</sup>**.

**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, W10-11

Head GSI: **Wenyu Li** (wenyuli@berkeley.edu) 1171 Etcheverry Hall.  
Office hours: Tuesday 13:00 -14:00 and Wednesday 13:00 - 14:00.

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](https://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 files as listed in the assignment document to the E7 course website by the assignment due date and time (Fridays at noon). You can upload your solutions 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. Links to unauthorized documents and direct answers to homework questions are not allowed.

## **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 30<sup>th</sup>. Weekly laboratory assignments will be available for download (on Fridays) 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 can run to check the grade of your solutions. The auto-grader pfile will grade your work and will print out your scores for each problem and error information, if any, on your command window. You can upload your solution files 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 zero credit for the entire assignment and additional disciplinary action (see the Academic Honesty section below).**

(iv) Students may use the computers in 1111 Etcheverry when the room isn't booked for a class (which is most of the day). 1111 Etcheverry is open while the building is open. This page has the calendar for 1111 Etcheverry: <https://www.decf.berkeley.edu/help/facility/1111-cal.html>

Computers equipped with MATLAB are also available in other facilities on campus.

(v) We will drop two of your lowest homework grades from the final grade calculation. For example, if for your assignments you receive all 100 but one 50 and one 10, then your homework grade that enters your final grade calculation will be 100 (because we drop your two lowest homework grades which are 50 and 10).

## 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 11 and November 22.** 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 19, 7-10 pm.** You will be required to provide positive ID before entering the examination rooms. ALL DATES ARE TENTATIVE. IT IS YOUR RESPONSIBILITY TO FOLLOW CLASS, DISCUSSION SECTION AND BCOURSES ANNOUNCEMENTS FOR THE LATEST UPDATES.

## 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
<b>Midterm 1 Exam</b>
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)
<b>Midterm 2 Exam</b>
Statistics
Numerical Integration
Modeling engineering systems using differential equations
Solutions of Differential Equations
ODE Solvers
<b>Final Examination</b>