

ENG EK 125 Introduction to Programming for Engineers Fall 2020

SYLLABUS

(Classes and discussions listed; labs always follow classes)

Date	Topics
Week # 1	
9/2	Class 1: Introduction to EK 125; Introduction to MATLAB, Characters, Relational expressions (M Chapter 1)
9/4	Discussion 1: Problem solving techniques; Mock quiz
Week # 2	
9/7	<i>Holiday; No class</i>
9/9	Class 2: Vectors, Matrices (M Chapter 2)
9/11	Discussion 2: Practice Quiz
Week # 3	
9/14	Class 3: Intro to Programming, Scripts, I/O, Plots (M 3A: Sec 3.1-3.6)
9/16	<i>Last day to add a course</i>
9/16	Class 4: Functions, Programs, Commands (M 3B: Sec 3.7-3.9)
9/18	Discussion 3: Quiz 1
Week # 4	
9/21	Class 5: If statements, Relational expressions; switch statements; “is” functions (M Chap 4)
9/23	Class 6: Loops: for, nested (M5A: Sec 5.1-5.2)
9/25	Discussion 4: Quiz 2
Week # 5	
9/28	Class 7: Loops: while, error-checking; Vectorizing, Timing Code (M 5B: Sec 5.3 - 5.5); HW 1 Due
9/30	Class 8: Exam Review
10/2	Discussion 5: Exam Review
10/2	*** EXAM # 1 4:30 – 6:00 pm Online

Week # 6

- 10/5 Class 9: User-defined functions, MATLAB program organization (M 6A: Sec 6.1-6.3)
- 10/7 *Last day to drop a course (without a “W”)*
- 10/7 Class 10: Scope, persistent variables, Debugging, Live scripts (M 6B: Sec 6.4-6.6)
- 10/9 Discussion 6: Quiz 3

Week # 7

- 10/12 *Holiday; No Classes*
- 10/13 *Monday Schedule at BU*; Class 11: Text Manipulation (M Chapter 7);
HW 2 Due
- 10/14 Class 12: Advanced data structures (M Chap 8A: Sec 8.1-8.3)
- 10/16 Discussion 7: Quiz 4

Week # 8

- 10/19 Class 13: Data Transfer (M Chap 9)
- 10/21 Class 14: Advanced functions: variable # of arguments, anonymous functions (M Sec 10.1-10.2)
- 10/23 Discussion 8: Quiz 5

Week # 9

- 10/26 Class 15: Statistics, Sets, Intro to Machine Learning (M 14A: Sec 14.1-14.3, additional notes online); **HW 3 Due**
- 10/28 Class 16: Exam Review
- 10/30 Discussion 9: Exam Review
- 10/30 *** EXAM # 2 4:30 – 6:15 pm Online**

Week # 10

- 11/2 Class 17: Command Line Interfaces; Intro to C (C Chapter 1)
- 11/4 Class 18: Selection Statements and Loops (C Chapter2)
- 11/6 *Last day to drop a course (with a "W")*
- 11/6 Discussion 10: Quiz 6

Week # 11

- 11/9 Class 19: Data Structures: Arrays, Strings, and Structures (C Chapter 3);
HW 4 Due
- 11/11 Class 20: Introduction to Functions and Program Organization in C (C 4A:
Sec 4.1-4.6)
- 11/13 Discussion 11: Quiz 7

Week # 12

- 11/16 Class 21: Pointers, Call-by-reference (C 4B: Sec 4.7); **Project Proposal Due**
- 11/18 Class 22: Dynamic Memory Allocation (C 5A: Sec 5.1)
- 11/20 Discussion 12: Quiz 8

Week # 13

- 11/23 Class 23: Introduction to Linked Lists (C 5B: Sec 5.2.1-5.2.3)
- 11/25-11/29 *Holiday; Thanksgiving Recess*

Week # 14

- 11/30 Class 24: Common Operations on Linked Lists (C 5C: Sec 5.2.4 – 5.2.5)
- 12/2 Class 25: Exam Review
- 12/4 Discussion 13: Exam Review
- 12/4 ***** EXAM # 3 4:30 – 6:15pm Online**

Week # 15

- 12/7 Class/Lab 26: Project Presentations
- 12/9 Class 27: What's Next; Course Evaluations; **Project Due**
- 12/10 *Last Day of Classes*

ENG EK 125 Introduction to Programming for Engineers

Fall 2020

COURSE INFORMATION – DRAFT Subject to Change, Last Modified 8/27

Cast of Characters

Lead Instructor: Professor Stormy Attaway
Department of Mechanical Engineering
email: sa@bu.edu

Instructor: Dr. Jake Herrmann
email: jakeherr@bu.edu

Graduate Student Teachers (GST's):

- See separate list
- The GST's are graduate students. They help in the class sections, and hold office hours. Some may assist in discussion sections.
- There is one GST per lab sections; their main duty is to be in charge of the lab and to grade the homework assignments and project for their lab section.

Teaching Assistants (TA's):

- See separate list
- The TA's are undergraduates and LEAP students. Their duties are to help in the class, lab and the discussion sections, grade the weekly quizzes, and hold office hours. Some experienced TA's are designated as "Senior TA's"; they may lead discussion sections.

GST/TA Office Hours will be held online, the evenings before class days. Check the course web site for details.

Course Material

The goal of this course is to introduce first-year engineering students to modern computational environments used to solve engineering problems. In the context of engineering applications, basic procedural programming concepts will be covered including input/output, branching, looping, functions, file input/output, data structures (arrays, strings, and structures), pointers, and memory management. Emphasis will be on programming style, debugging, top-down design and modular code. Specific topics are listed in the course syllabus.

Course Outcomes

As an outcome of completing this course, students will:

- Gain knowledge of basic procedural programming concepts and computational thinking
- Become proficient in the use of modern computational tools
- Develop basic problem solving skills
- Develop experience in designing a solution to engineering problems using software
- Be able to document solutions to engineering problems and communicate the results

- Work in teams to design a solution to a societal problem

BU Hub Learning Outcomes

This course covers:

- Quantitative Reasoning I
- Creativity/Innovation

Course Format

EK 125 has been a fully flipped course for several years, so the class is entirely active learning. What that means is that instead of a traditional lecture followed by you trying to do homework, we flip or reverse that: you watch online lecture videos and answer assessment questions online before coming to class, and then class time is entirely active learning; working on problem sets in small groups. All education research shows that students learn much more (and more deeply) from active learning environments and therefore Prof. Attaway spent hundreds of hours flipping the course, creating the lecture videos for you to watch and all of supporting documents that you will see online.

When the class section itself is online, the format is still the same. You will still work together on problem sets, through online break-out rooms rather than in person.

All students must be registered for one Lecture section, one Lab section, and one Discussion section. The lecture/class (they are called “Lecture” by the registrar, but we call them “Class” because the lectures are actually done online before class) sections are Mon/Wed. The labs in all cases follow the classes; they are held Mon/Wed afternoons. The discussion sections are all on Friday. (Note that the Fri 4:30-6:15 time listed under “Lecture” is actually the Quiz and Exam time. See syllabus for dates.) Many sections become full quickly, so it is imperative that you only attend those sections for which you are officially registered. Waiting lists will be maintained in the beginning of the semester for anyone who wishes to change into a section that is full, on a first-come-first-served basis.

Basically, one concept will be covered each day. Students are expected to be fully prepared before class. That means reading all relevant sections in the text thoroughly, watching all relevant online lecture videos, and responding to the online assessment questions. Most class periods will start with a short (5 minute) Individual Practice Problem (IPP). The remainder of the class period will consist of Group Practice Problems (GPP), which you will complete together without using any software.

After that, during lab, you will work on another set of practice problems, called a Worksheet, using the software. During the lab, there will be worksheet problems to work on, based on the material covered in the class earlier that day. All worksheet solutions must be tested, either in MATLAB or in C. As a continuation of the lab, you will have another set of problems to be done on MATLAB Grader during the MATLAB portion of the course. Extra problem sets will also be available for students who wish to have more programming experience; these are optional.

In the discussion sections on Fridays, the Senior TA’s and GST’s in charge of the section will review the week’s material, and answer any questions that students may have. In some cases, extensions of the material will be covered also. On most of the discussion

days, there will be a short (15 minute) quiz later in the day on the material covered that week (the exact dates are listed in the syllabus). The quizzes will begin at 4:30pm.

Course Websites

The course materials will be on the course website on BlackBoard Ultra. This can be accessed from learn.bu.edu. A separate document, “EK 125 Course Accounts,” details other accounts that you will need, on Zoom, Gradescope, MATLAB, and MATLAB Grader. Please follow the instructions carefully and always use your BU email address.

Learn *from* Anywhere

Please note that what is detailed in this entire document is the current plan. Everything is subject to change, however.

As a fully flipped course, it is easier for EK 125 to follow the Learn *from* Anywhere (LfA) paradigm than other courses. The lectures are already online, and have been for many years. Everyone, regardless of where you are, can access the online pre-class activities (including the lecture videos and assessment questions) before class begins.

The lab sections and office hours will be conducted entirely online. Everyone is expected to attend lecture and discussion sections synchronously, since they are earlier in the day EST.

The traditional active learning environment in class was to have three groups of three students sitting together at round tables, working together on the GPP. The instructor and TA’s walked around the room directly behind the students, observing, listening, interjecting as necessary and answering questions. Obviously this cannot be done this semester. The best way to simulate this active learning environment is to have students working together in break-out rooms, for example on a Zoom meeting, with the instructors and TA’s hopping in and out of the break-out rooms again to observe, listen, interject as necessary and answer questions. In fact, we just completed a summer offering of the course and this worked very well. We found that the best practice was for everyone to unmute and show their video, and to have one person share their screen while working on the problems. All online, with nobody having to wear masks, it was a very good approximation to working together in class. It felt very natural; everyone could see and hear each other, and got to know each other. With the LfA model, everyone (whether in person or online) will be doing this, working together in break-out rooms online. For students who choose to attend the classroom, the instructors and TA’s cannot walk around the room, so they will still have to interact with the students online. Due to the small capacities of the rooms, students will have to be platooned and will be notified of days when they are eligible to attend in-person should they so desire.

The format for discussion sections will also be using Zoom meetings, although not likely with break-out rooms. The TA’s will screen share to review material. Q&A will be done through the audio, and/or by chat.

Asynchronous: with this flipped class, there will not truly be any asynchronous students. The active learning part of the course is a very important component, and everyone will be required to work together on the GPP in break-out rooms. Everyone is expected to attend their lecture and discussion sections synchronously. For students who are in far-

away time zones, alternate section time(s) will be created later in the evening, Eastern Standard Time, for the lab sections. One alternate Quiz/Exam time will also be created. So, there will not be asynchronous students; you will just use different sections that will be created once we find out how many students are in this situation, and what time zones they are in.

Since there are simultaneous class sections, there are two Instructors for the course. The original plan was for Prof. Attaway to be in one room on Mondays, and Dr. Herrmann in the other, and then they would switch on Wednesdays so that you would see each once per week in Class. Now, with the LfA paradigm and the need to platoon, Prof. Attaway and Dr. Herrmann will switch so that you should be able to see one of them every two or three classes in the classrooms, should you desire to be in a classroom.

Textbook

The text is “MATLAB: A Practical Introduction to Programming and Problem Solving, Fifth Edition” by Stormy Attaway, © 2018 Elsevier, Inc. ISBN: 978-0-12-815479-3. For the last part of the course, a pdf of a manuscript “C Programming for MATLAB Programmers” will be available for students to use online. The sections to be read before each lecture are listed in the syllabus next to the topic. For best comprehension, it is very important to read through everything including the Quick Questions, and to work on the Practice problems. Note we are using the Fifth Edition of the MATLAB book, which is organized in a slightly different way and contains much more material than the first four editions. Either hard copy or e-book is fine.

Grading

Letter grades are given only for the entire course, not for individual assignments or tests. Numerical grades will be calculated for every student, based on the following percentages:

Class (attendance, pre-class & in-class Practice Problems)	15%
Lab (attendance, Worksheets and MATLAB Grader Problems)	15%
Homework Assignments and Final Project	15%
Discussions (attendance, Quizzes)	15%
Exam 1	10%
Exam 2	15%
Exam 3	15%

Class, Lab, and Discussion grades include attendance. The cut-offs for the different letter grades will depend on the distribution of numerical grades at the end of the semester.

Usually, the ranges are: 90 and above is an A (A- or A), 80 + is a B, 70+ is a C, 60+ is a D and below 60 is an F. (There may be a curve, but if so it would be in the favor of the students, e.g. an A- might go as far down as 89, but it would not be raised to 91.) The cutoffs between the letter grades for a given range (e.g., B+, B, B-) will depend on the actual numerical grades and will not be determined until the end of the semester. In addition to the numerical average, students **must demonstrate a mastery of the material by having a passing average on the last two exams and on the Homeworks/Final Project** in order to earn a passing grade in the course.

Class Grade

Students are expected to be on time for every class, and are expected to be prepared for every class by doing the reading and completing all online material. Please note that the reading covers all of the material; the online slides do not necessarily cover everything.

Therefore, the online materials supplement the reading; they do not replace the reading. During the class period, students will be given sets of Practice Problems. Individual Practice Problems (IPP) are to be completed in the very beginning (first five minutes) of the class period, most likely online on the BlackBoard course site. These will be followed by Group Practice Problems (GPP) to be done in small groups in break-out rooms; reference materials may be used for these problem sets. Students are requested to NOT use software (MATLAB or C) during class. Points will be deducted from the class grade if a student (a) arrives late; (b) is not prepared; (c) leaves early; or (d) does not answer Practice Problems. The class grade will be a combination of attendance, online, and in-class Practice Problem solutions, including the 5-minute IPP that will be graded. One class attendance grade and one IPP grade will be dropped.

Lab Attendance

For the lab, students will be given worksheet problems to work on during the lab period. Students will receive full credit for every lab for arriving on time and either completing all of the worksheet problems in MATLAB or C, or spending the full amount of time diligently working on these problems. Points will be deducted from the lab attendance score if a student (a) arrives late; (b) is not prepared for lab; (c) leaves early without completing all of the worksheet problems in MATLAB or C; or (d) does not spend the time diligently working on the current problems. All worksheet problems must be completed and submitted on BlackBoard. If the worksheet problems are not completed during the lab period, students must complete them on their own. One lab attendance grade will be dropped.

Worksheets and MATLAB Grader Problems

For full credit on the worksheet, the solutions for the worksheet problems must be completed and submitted within two days. For the MATLAB part of the course, MATLAB Grader Problems must also be completed within two days. The solutions to these problems must be submitted on the MATLAB Grader site. For these problems, test scripts have been written by the course staff to test whether your solution not only works in MATLAB, but does exactly what the problem specifies. One worksheet grade will be dropped.

Homework Assignments

Homework assignments will be submitted throughout the semester. Due dates are listed on the syllabus, and rules for working in groups will be specified on each homework description. Homework assignments will be posted on the course web site.

Final Project

The final project will be due on the last EK 125 class day of the semester. This is a programming problem, which is larger in scope than the problems that can be done during the scheduled lab periods. It will also be an open-ended problem, for which there is no set answer. Specific guidelines will be provided at least six weeks before the project due date. Late projects will NOT be accepted, for any reason. The final project will be a group project. PROGRAMS THAT DO NOT RUN WILL NOT NORMALLY BE ACCEPTED.

Quizzes

There will be 8 quizzes this semester, given on Friday afternoons at 4:30. The exact dates are listed in the syllabus. The quizzes will usually be 15 minutes long, with 5 minutes to upload. Each quiz will be on the material covered that week. There will be NO make-ups for quizzes for any reason; however, one of the grades will be dropped before the quiz average is calculated.

Exams

There will be three exams, given on Friday afternoons at 4:30. The exams will be 1.5 hours long, with 15 minutes to upload. The first exam will be given on Friday October 2. The second exam will be given on Friday, October 30. The third exam will be given on Friday, December 4. The exams will be submitted online.

Exam study sessions will be held on the evenings before the exams.

Make-ups

As explained in previous sections, there are no make-ups for homeworks, quizzes, or the final project. Since most students will have a valid reason for missing a class during the semester (for example, due to illness), one class attendance grade will be dropped, one IPP grade will be dropped, one lab attendance grade will be dropped, one worksheet grade will be dropped, one discussion attendance grade will be dropped, and one quiz grade will be dropped.

Make-up Exams

Make-up exams will be more difficult than the regularly scheduled exams. The only valid reasons for missing an exam are: death in the immediate family, serious illness (documented by a physician), or a conflict with a scheduled Boston University event. If you feel that you have a valid reason for missing an exam, you must petition to Prof. Attaway for permission to take the make-up. This petition must be received BEFORE the regularly scheduled exam (except in cases of extreme emergency). Petitions should be submitted as soon as possible. Petitions are not always granted! If the petition is granted, a mutually convenient time for the make-up exam will be arranged.

Incompletes

Incompletes will ONLY be given for those students who miss the third exam and whose petitions for the make-up have been granted, and for whom the make-up has been scheduled for a time after the final grades for the semester have been determined. An incomplete contract must be filed in that case before the end of the semester.

Grievance Procedure

Requests for regades can be made through Gradescope.

Collaboration Policy

Students are allowed (in fact, encouraged) to work together on the Practice problems and on the lab worksheets, and in groups on the project. Working together means truly working together, exchanging ideas, NOT copying. Copying another's work is cheating, as is allowing someone else to copy your work. All quizzes and exams must be done by each student individually. Exchanging answers with anyone else, or using websites such

as Chegg, will be considered to be cheating. Anyone caught cheating may be subject to disciplinary action by the Committee on Student Conduct of the College of Engineering. Also, anyone found guilty of cheating will receive a 0 for that particular grade. Please note that these are policies for ENG EK 125; other courses may have different policies. When in doubt, ask before you collaborate! Please remember the University's Academic Conduct Code, which can be found at: <https://www.bu.edu/academics/policies/academic-conduct-code/>

Inclusion:

All members of this class, as well as the course team, are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Accommodations:

- Accommodations for Students with Documented Disabilities If you are a student with a disability or believe you might have a disability that requires accommodations, requests for accommodations must be made in a timely fashion to Disability & Access Services, 25 Buick St, Suite 300, Boston, MA 02215; 617-353-3658 (Voice/TTY). Students seeking academic accommodations must submit appropriate medical documentation and comply with the established policies and procedures <http://www.bu.edu/disability/accommodations/>
- For students who receive extra time on quizzes and exams, please let Professor Attaway know (even if you do not yet have the official documentation) and email your schedule so that alternate times may be determined.