

ENAS 130 Introduction to Computing for Engineers and Scientists

YSS Summer 2021

Where: Mondays, Wednesdays and Fridays online

Who: Instructor- Dr. Richard W Freeman, PE (Richard.Freeman@yale.edu)

Office Hours are

All TF, ULA and CBPTs are listed on Canvas, along with their Office Hours and Help Sessions.

Course description This course will prepare you to use computers as problem-solving tools. It will introduce you to the C Programming and Arduino with which you'll solve a variety of problems drawn from mathematics, science, and engineering. Topics include general problem-solving techniques, object-oriented programming, elementary numerical methods, data analysis, and graphical display of computational results. The course will cover three primary topics, plus one secondary topic:

C Programming (3 weeks)

Arduino (2 weeks)

Prerequisite: MATH 115 or equivalent.

Recommended preparation: previous programming experience. Intended audience, as stated above, previous programming experience is recommended. In other words, a bit of prior exposure to the concepts of variables, conditionals, loops, and functions in ANY programming context is very helpful. If you have absolutely no programming experience at all, you can still succeed in ENAS 130, but be aware that to do so means that you will likely spend more time on this course than others with previous programming experience. On the other hand, if you have already taken several programming courses in high school and are a proficient programmer, or you have taken a 200-level CPSC course at Yale, please do not take this course. You will be bored, and your apparent ease of mastery of the course material will be a source of frustration to others in this course who have very little (or no) programming experience. If you already have considerable programming experience but this course is required for your major, check with your DUS about using a different course (e.g., CPSC 201) to fulfill that requirement. Lastly, if you are interested in taking this course only because you want to learn Matlab, you will be disappointed. Note that while ENAS 130 normally includes two weeks of MatLab, this YSS session will not.

Textbook: There are no required textbooks for this course, but you will need to purchase an Arduino-compatible kit, a couple of gear motors and download some software. Materials listed below are available from Amazon:

Elegoo UNO Project Super Starter Kit with Tutorial and UNO R3Compatible

DC 3-6V TT Gear Motor Dual Shaft

Elegoo EL-CP-004 Multicolor Dupont Wire

Much of what you need to learn will be in the course lecture notes. There are some recommendations for C and Arduino resources:

- Learn to Program with C, Noel Kalicharan
- Programming Projects in C for Students of Engineering, Science and Mathematics, Rouben Rostamian
- Online tutorials such as www.cprogramming.com, C++ tutorials at www.learncpp.com.
- There are several online resources for Arduino. You can search Youtube or go to www.arduino.cc

Grading: There are no preset ranges that map numerical scores to letter grades. Course grading will be curved, and there are no pre-determined distribution ranges for letter grades. Your course average will be based on:

Graded Items	Number of Items	Percentage of Average
Problem Sets	3	50%
Midterm Exams	2	30%
Final Project	1	20%

Psets, or problem sets, will be posted Mondays and due the following Mondays at 11:59pm. Each pset will have approximately two to three problems that you need to solve by writing a program. In addition, you may be asked to submit a solution in paragraph form. The idea is to get you thinking about how to solve the problem before writing a program to solve the problem. The TAs will grade your psets by running your program with various input values. An ideal program should:

1. Compile and run without error
2. Get the correct answer and
3. Include reasonable comments and be written using good programming style

Each pset will be graded using the above criteria.

Midterms will be given on Monday, June 21st and Monday, July 5th. Each exam will be approximately one hour (60 minutes). Each exam is worth 15% of your grade. A Dean's Excuse is the only acceptable reason for not being able to take an exam at the scheduled time.

Final Project is due on Wednesday, July 7th at 11:59pm.

Uploads: You will submit programs for psets and exams via Canvas. When you submit code, upload the source code only (.c or .ino files).

After uploading your code to Canvas, wait a minute before closing your web browser so that the upload process can finish. Also make sure that you submitted the right file. Submitting the wrong file or an unreadable/unopenable file will be considered equivalent to not submitting a file.

The TAs will use a script to speed up the mechanics of running everyone's code, so please remember to name your file using the format requested in the directions at the top of each pset or exam. Any codes that do not conform to the requested format might not be detected by the script. However, if you revise your code and upload a new version, do not worry about the fact that Canvas may insert a version number as part of the filename; the script will still be able to detect your code.

Late policy: Psets are due at 11:59pm on the due date. We are using the same policy from the Fall 2019 course- for every eight hours (or portion thereof) that you submit your pset late, your pset grade will drop by 5 points. Psets that are more than 48 hours late **WILL NOT BE ACCEPTED**.

The most recent submit times of your programs will determine when your pset was submitted. For example, if a pset has two problems, and you submit Problem 1's code before the deadline, but Problem 2's code after the deadline, then the entire pset is late, and your grade will reflect the point deduction described above. Similarly, if you submit multiple versions of a program, the most recent version is the one that will be graded; if you submit the first version before the deadline, but another version after the deadline, then your pset is considered late, and will have points deducted.

There are only two ways of submitting a pset late without penalty- Dean's Excuse or instructor's permission. You are responsible for informing Dr. Freeman as soon as possible about 1) your situation and 2) whether you have a Dean's Excuse. For non-emergency situations, you must contact Dr. Freeman at least 24 hours before the pset is due.

Academic integrity: Programming in this course is an individual activity, in which you must reach your own understanding of the problem, then create and code a solution. You can discuss the problem with others, but your coding solutions must be written by you. **Do not under any circumstances copy another person's work. Also do not permit anyone else to copy your work.** Both acts are clear violations of ethical and academic standards that carry serious consequences.

If, when writing your program, you suspect that it is not working properly, but cannot debug it, then Dr. Freeman and the CBPTs will be happy to help you. For that reason, it is a good idea to begin each pset as early as possible, so that you will be able to go to at least one office hour or help session.

Computer Resources: To program in C, we will use Qt (pronounced “cute”), an Integrated Development Environment (IDE) that you can download onto your own computer. Instructions for obtaining Qt are listed in the lecture notes. Qt will also be available on computers in Dunham 120.

Course site on Canvas: Canvas is the central location for course resources. Please check Canvas on a regular basis. Course lecture notes, example programs and files, as well as, psets and other assignments will be uploaded and available on Canvas. All emails to the class will be archived as announcements on Canvas, in case you accidentally delete your own copy of any class-related email.

ENAS130- YSS Syllabus for C Programming and Introduction to Arduino

Day	Date	Topic	Due
Monday	June 7 th	Problem Solving and Computing	
Wednesday	June 9 th	Introduction to C Programming	Odd or Even Numbers
Friday	June 11 th	Program Structure and Variables	Prime Numbers
Monday	June 14 th	Hello World	Pset #1
Wednesday	June 16 th	Conditional and Control Structures	Determining Leap Year
Friday	June 18 th	File Input/Output	
Monday	June 21 st	Functions and Modular Coding	Pset #2, MIDTERM 1
Wednesday	June 23	Pointers and Arrays	
Friday	June 25 th	Arduino 1- Arduino and Arduino IDE (Hello World and Blink)	
Monday	June 28 th	Arduino 2- Displays and Serial Monitor	Pset #3
Wednesday	June 30 th	Arduino 3- Motors	
Friday	July 2 nd	Arduino 4- Temperature	
Monday	July 5 th	Arduino 5- Sound and Light	MIDTERM
Wednesday	July 7 th	Arduino 6- IoT and Wrap-up	Final Project