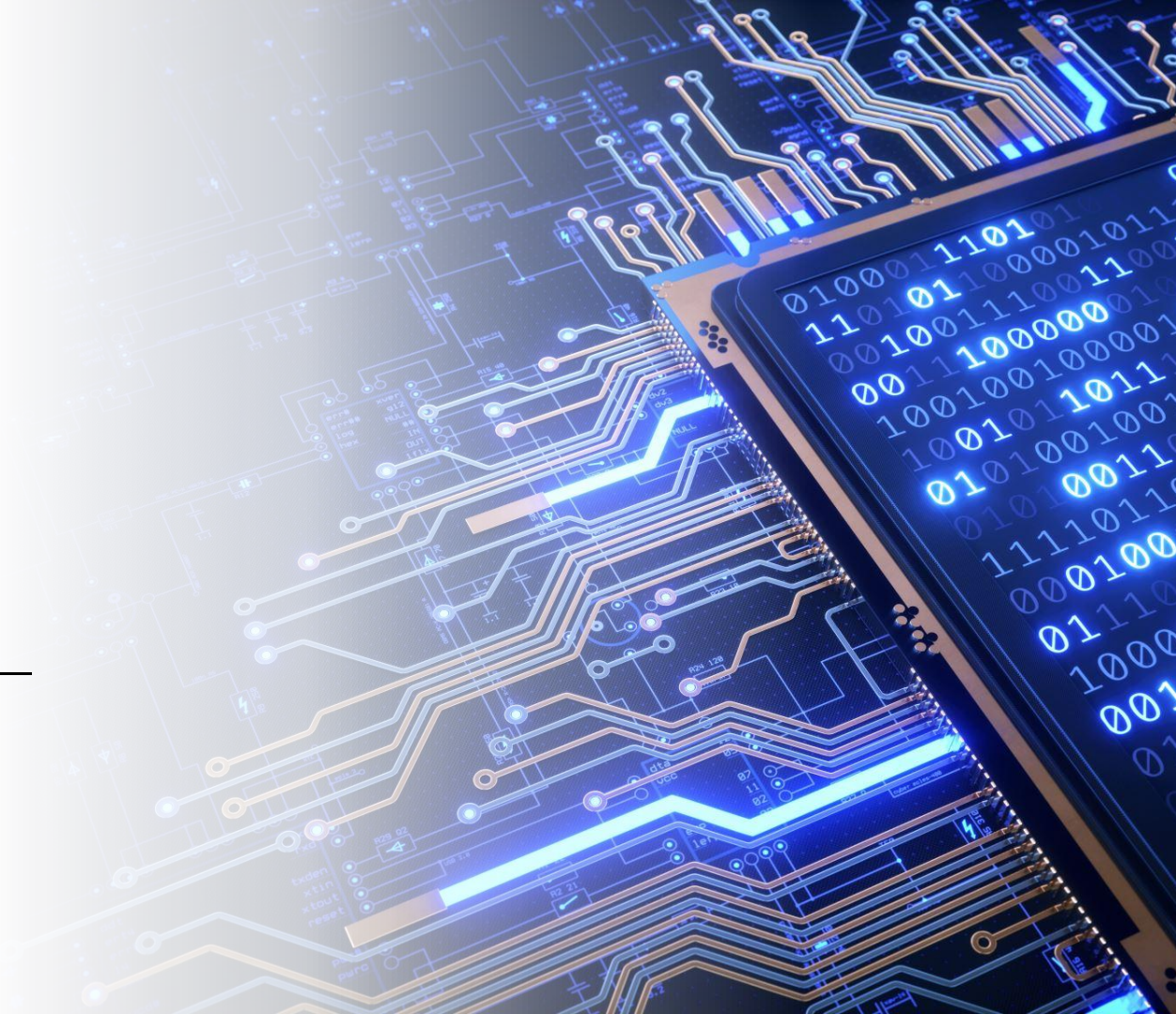
CPE 301 Embedded Systems Design



Who am I?

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Office Hours: Thursday 2-4pm

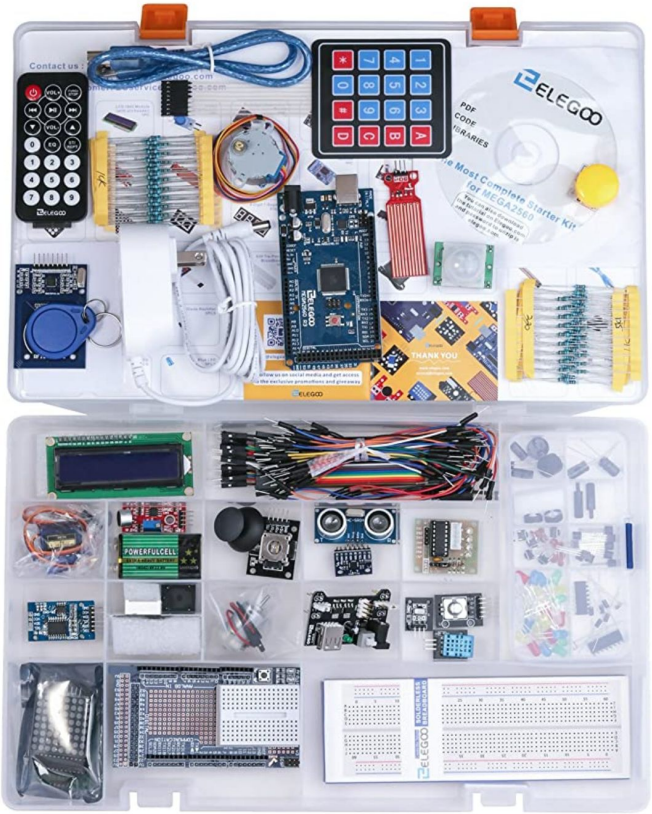
Course Overview

- Review/introduction to C and basic electronics principles
- Embedded systems architecture
- Microcontrollers (architecture, etc.)
- Interfacing microcontrollers with the outside world
- Specific technologies and techniques
  - Arduino programming and interfacing
    - Memory and I/O operations
    - Timers
    - Interrupt systems
    - Analog to digital conversion
  - Field programmable gate arrays (FPGAs)

Required Hardware

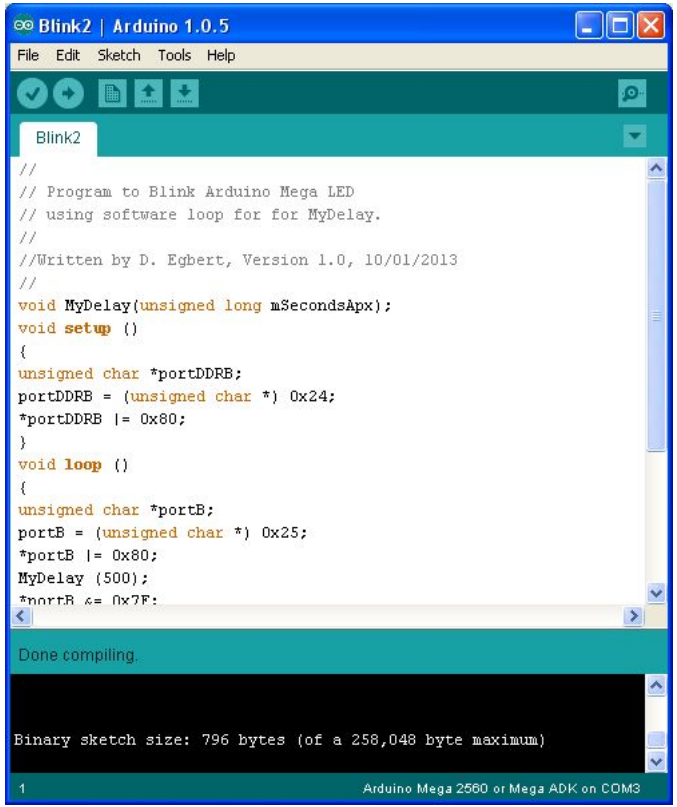
- Arduino Mega Rev 3 2560 Kit from Elegoo
- https://www.amazon.com/gp/product/B01EWNUUUA/
- Optional: EspoTek Labrador Oscilloscope and Signal Generator
  - If you own a scope, you can use it instead!

Make sure it is Mega 2560 Controller Board



Software Requirements

- Arduino IDE
- Free and cross platform
- URL: https://www.arduino.cc/en/Main/Software



Course Requirements

- Project
  - Design and implement a small embedded system (normally a water cooler system). However, you are welcome to propose your own project idea.
  - Groups are of at most 4 people. THIS IS THE FINAL FOR THE COURSE.
- Exams
  - There will be 6 mini-exams. The exams will be given over WebCampus. Two attempts per exam.
  - One must take the first attempt to be able to take the second attempt.

Course Requirements

- Labs
  - There are 9 labs this semester. The labs must be completed and submitted on due time which will be normally on the next week. But may be accomplished at home with the required kit. Attendance is not necessary.
- Lab Report
  - You will be expected to submit your lab assignments in your designated lab section in the form of a lab report, ino files and pictures of every step of the circuit, and code.
  - The report will contain a (brief) section for either an introduction or abstract, then answers to any questions asked.
  - You may receive a 10% (on a scale of 10, 1 extra point) extra credit to follow technical standards of your respective governing agency (IEEE, ACM or BMES etc) written in LaTEX, must provide the .tex file or the shared link to WebCanvas

Course Requirements

- Late submission policy

  30 minutes of grace will be given after the due time, assuming the students may face internet/submission/device issues. However, after the grace period, all the submissions will be treated as LATE SUBMISSIONS.

  IF YOUR SUBMISSION IS LATE BY 1 DAY, YOU WILL HAVE A 20% PENALTY.

  LATE SUBMISSIONS AFTER THAT WILL BE ACCEPTED FOR AT MOST 50% CREDIT.

  In case of late submissions the 30 minutes grace in due time will not be given.

Grading Criteria

STUDENTS MUST PASS BOTH LECTURE (exams and final project) AND LAB IN ORDER TO PASS THE COURSE.

Passing the lecture means that the average score for all EXAMS is passing (>=50)

Passing the Lab means that the average for all LABS is passing (>=50) and must receive a passing score on the final project (>=50).

Grading Criteria

Lab grade 30 %

Exams 40%

Final Project 30 %

Extra Credit 2%

What is Next?

- Overview of embedded systems
- Intro (for some) and review of basic electronics that will help in understanding the material and the labs
- Brief review of binary numbering system and calculations
- Review of basic coding in C, with a focus on bit-level manipulation and pointers