

EE40: Introduction to Circuit Design

Behnam Behroozpour

Summer 2015

(updated May 2015)

Instructor

- Behnam Behroozpour, EECS
- 490 Cory Hall
- <http://www.eecs.berkeley.edu/~behroozpour>

Objectives

Analyze, design, build and test electronic circuits, and understand their capabilities and limitations.

1. Understand fundamental circuit principles
 - Lumped circuit model (Kirchhoff's laws)
 - Energy storage (capacitors and inductors)
 - Time and frequency domain signal representations
 - Analog and digital signals, conversion
2. Design, build, and test electronic circuits
 - Circuit hierarchy and modularity
 - Laboratory practices (breadboarding, test equipment)
 - Guided laboratories + project
3. Understand circuit limitations
 - Circuit imperfections (e.g. component variations)
 - Power / accuracy / speed tradeoff
 - Moore's law (technology and economic implications)

Textbook

Ulaby and Maharbiz, *Circuits*, 2nd Edition, 2012. The first edition has different chapters in different order. You might be able to get by with that, but I recommend the second edition.

Lecture

- Monday, Wednesday, Friday
- 12 – 2 pm
- 155 Dwinelle

Office Hours

Behnam

- Mon 4 - 5 pm, 540 Cory Hall
- Fri 10-11 am, 504 Cory Hall
- Or, you can email me for an appointment if you aren't able to make regular office hours
 - behroozpour@berkeley.edu

GSI's:

- TBA and posted on the Piazza page

Grading

Grading is curved. The mean is usually set to a B; one standard deviation corresponds to one letter grade. (eg. If the class mean is 80 and the std dev is 10, then the boundary for a B is set to 80, the boundary to receive a C to 70, the boundary for an A to 90, etc.).

- Homework: 15 %
- Midterms (2): 30 %
- Final Exam: 25 %
- Labs: 30%

Quizzes: There are between 2 – 6 quizzes given in class throughout the semester with little or no notice. They usually last 10-15 minutes and are intended for practice and gauge what you are learning. They are not intended as individual assignments; working in teams of any size, involving any amount of chaotic activity is encouraged. These are NOT GRADED. Instead, if at the end of the class you wish to discuss why you deserve a B+ instead of a B (because you are 0.00001% away from the boundary), they can help.

Videos

- Short MOOC-style videos on the majority of topics covered in EE40 are available via YouTube. These were recorded by Prof. Vivek Subramanian and Prof. Maharbiz.
- For EE40, these videos are intended to function just as textbook reading does: you are expected to view chapter-relevant material ahead of discussion in lecture as a way to prepare for the material.
- I lecture in class, so the videos are not to entirely replace them. Having said that, if you find you are doing well watching only the videos, I have no problem with it. **I will endeavor to alert you to anything in lecture not covered in the videos but I do not guarantee this ahead of time: lectures are the standard, not the videos. Also the lecture notes posted on piazza won't have solutions to the examples and you will see the solutions only during the lecture. No annotated lecture notes will be posted on piazza either.**
- (see below for lab videos)

Class Website

- The class website is on piazza.com. All course material, announcements, etc. will be handled through Piazza
- The BCourses site is to manage grades; I will announce as we add grades to that site so you can check for errors
- Piazza is embedded into the Bcourses site for convenience

Homework

- Posted on Wednesdays on Piazza
- Must be submitted ELECTRONICALLY on gradescope.com by 11pm on the Friday after release date
- Materials covered in Homework are intentionally ahead of lectures
- Your lowest HW score is automatically dropped

Tests

- Missed exams will only be allowed for medical reasons or research-related travel and HAS TO BE APPROVED BY ME OVER EMAIL **two (2)** weeks in advance.

Cheating

- No excuses; I will seek the maximum penalty and fully follow the department policy (except, I don't allow repetition of work under *any* circumstance) <http://www.eecs.berkeley.edu/Policies/acad.dis.shtml>

This lab is designed to help you get started with electrical circuits and take you to a level where you can dive into a more individual design experience.

Building and customizing a vibrating walker robot

- The labs are based around a set of videos prepared by Tom Zajdel and Prof. Maharbiz. They were launched in spring as a stand-alone MOOC as well.
- They gently introduce you to the basic concepts in the class while you build a popsicle-stick vibrating hopper robot.
- You will also get written prelab guidelines that will include a set of assignments to prepare you for the lab experiments.
- Although the basic skeleton is fixed (and pretty basic), there is tons of room to hack your own craziness into the robot (more on this below).

Logistics

- You will work in pairs.
- In essence, the lab guidelines are a combination of videos and written prelabs.
- You should submit prelab assignments before each lab session on Gradescope website.
- You are allowed to do as much as you want at home and come to lab to finish or get checked off.

Last 3 Sessions

- Here's the fun part.
- We give you three sessions at the end to add, build, modify, enhance, add sentience to, wake up Skynet, etc. with/to your robot.
- This is basically the final project and the GSI's will have detailed instructions on what is allowed and how it is graded.
- There will be a process of discussing your ideas with GSI's prior to this period.

Lab 1: Soldering Basics	Wed 6/24 – Thu 6/25
Lab 1: Fiat Lux!	Mon 6/29 – Tue 6/30
Lab 3: Voltage Regulator	Wed 7/1 – Thu 7/2
Lab 4: Resistors and Buffer	Mon 7/6 – Tue 7/7
No labs (Midterm-1 on Thu 7/9)	Wed 7/8 – Thu 7/9
Lab 5: Amplifier Architectures	Mon 7/13 – Tue 7/14
Lab 6: Capacitors	Wed 7/15 – Thu 7/16
Lab 7: DC Motors and Transistors	Mon 7/20 – Tue 7/21
No labs (Midterm-2 on Thu 7/23)	Wed 7/22 – Thu 7/23
Lab 8: Filters and Oscillators	Mon 7/27 – Tue 7/28
Hack 1	Wed 7/29 – Thu 7/30
Hack 2	Mon 8/3 – Tue 8/4
Hack 3	Wed 8/5 – Thu 8/6
<i>Check off / show off</i>	TBA

Exam Schedule and Rules

All exams:

- ONE 11" x 8.5" cheat sheet, anything on it
- Closed book
- NO comm enabled devices (no RF, no IR, etc.)

Midterm 1

- Thu 7/9
- Evening 7:00pm-8:30pm

Midterm 2

- Thu 7/23
- Evening 7:00pm-8:30pm

Final

- Friday 8/14 6-9pm

NO ALTERNATE EXAMS