EE 16B | Designing Information Devices and Systems II

Spring 2017

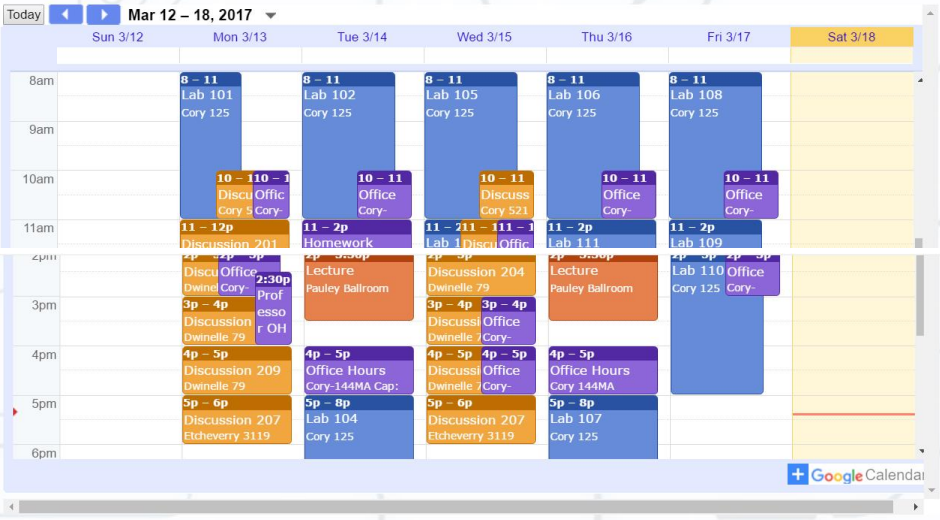
Calendar

The schedule is tentative and still subject to change.

Wk	Date	Lecture Topic	Section	Lab	Homework
0	01/17 Tu	Circuits/Intro			Homework 0
	01/19 Th	Circuits - transistors	Section 0B: KVL, KCL, op-amps review		
1	01/24 Tu	Circuits - RC transients	Section 1A: Digital logic and number representation	Introduction to Debugging	Homework 1
	01/26 Th	Circuits - 2nd order ODEs	Section 1B: RC circuits		
2	01/31 Tu	Circuits – inductors and 2nd order ODEs	Section 2A: 2nd order ODEs	Analog-Digital Converters I	Homework 2
	02/02 Th	Circuits - transfer functions	Section 2B: RLC circuits		
3	02/07 Tu	Circuits - filters and bode plots	Section 3A: Complex numbers	Analog-Digital Converters II	Homework 3
	02/09 Th	Circuits – frequency response of filters	Section 3B: Transfer functions		
4	02/14 Tu	Circuits - bode plots	Section 4A: Bode plots	Mystery Circuit and Mic Board Assembly	Homework 4
	02/16 Th	Control - state space representation	Section 4B: RLC and transfer function practice		
5	02/21 Tu	Control - linearization and stability		Color Organ: Part I	Homework 5
	02/23 Th	Control – stability cont'd	Section 5B: Linearization		
6	02/28 Tu	Control – controllability	Section 6A: System stability conditions	Color Organ: Part II	Homework 6
	03/02 Th	Control - state feedback control	Section 6B: Controllability		
7	03/07 Tu	Control – controller canonical form; outputs and observers	Section 7A: Feedback control	Mic Circuit	Homework 7
	03/09	Control – observability and observers	Section 7B: Block		

8	03/14 Tu	SVD – overview	Section 8A: Controller canonical form & observers	Introduction to Controls: Part I	
	03/16 Th	SVD - procedure	Section 8B: SVD		
9	03/21 Tu	SVD – geometric interpretation		Introduction to Controls: Part II	Homework 9
	03/23 Th	K-means			
10	03/28 Tu	Spring break – NO LECTURE			
	03/30 Th	Spring break – NO LECTURE			
11	04/04 Tu	Sampling/Interpolation - polynomial interpolation		Introduction to Controls: Part III	Homework 10
	04/06 Th	Sampling/Interpolation - interpolation and sampling theorem			
12	04/11 Tu	Sampling/Interpolation - aliasing and control		SVD/PCA	Homework 11
	04/13 Th	DFT			
13	04/18 Tu	DFT continued		Advanced Controls	Homework 12
	04/20 Th	LTI systems			
14	04/25 Tu	LTI systems and DFT		Integration	Homework 13
	04/27 Th	Wireless			
15	05/02 Tu	Review I			
	05/04 Th	Review II			

Weekly Schedule



Course Staff

Instructors

Murat Arcak
arcak@eecs.berkeley.edu

Michel Maharbiz
maharbiz@eecs.berkeley.edu

GSIs

Rachel Zhang
Administrative TA
rachelzhang@

Jessie Yang
Administrative TA
jessiejxyang@

Anastasia Shuler
Lab TA
ashuler@

Andrew Blatner
Lab TA
ablatner@

Ashley Lin
Lab TA
ashleyjl@

Beliz Gunel
Discussion TA
bgunel@

Brian Kilberg
Content TA
bkilberg@

Charles Zhang
Lab TA
charles2299@

Deborah Soung
Discussion TA
dsoung@

Edward Wang
Lab TA
edwardw@

Jane Liang
Discussion TA
yiliang@

Kevin Chen
Discussion TA
kevinchen297@

Tianrui Guo
Discussion TA
tianrui@

Vivek Athalye
Lab TA
viveka@

Please add berkeley.edu to the end of all emails

Resources

Midterms

Midterm 1 (solutions)

Lecture Videos

Note that you need to be logged into your @berkeley.edu account to view these videos.

Lecture 0A
Lecture 0B
Lecture 1A
Lecture 1B
Lecture 2A
Lecture 2B
Lecture 3A
Lecture 3B
Lecture 4A
Lecture 4B
Lecture 5A
Lecture 5B
Lecture 6A
Lecture 6B
Lecture 7A
Lecture 7B
Lecture 8A
Lecture 8B

Video Notes

Intro to transistors and digital logic
RC transients
Second-order circuits
Differential equations
Linearization
Observers and observability

Lab

Lab outline and overview
Oscilloscope cheatsheet
Intro to circuits debugging
Controls primer
Project deliverables
Project grading

Circuits

Charge
Current
Voltage
Kirchoff's laws
Parallel and series resistors
Voltage and current dividers
Thevenin/Norton equivalent circuits and source transformation

Linear Algebra

Eigenvalues and eigenvectors
Change of basis and diagonalization

DFT

Interactive guide to the DFT
Another textbook chapter (starts on page 144)
Fourier visualizations

PCA, SVD

SVD flags example A tutorial on PCA
A linear algebra review that concludes with SVD
An article about SVD and its applications
Image processing with the SVD
Visualization of the PCA
Visualization of k-means

Frequency Response and Impedance

Controls

Murray and Astrom
Franklin, Powell, and Workman

Policies

Grade Breakdown

- Homework: 10%
- Labs: 30%
- Midterm 1: 15%
- Midterm 2: 15%
- Final: 30%

Homework Party

Every week there will be a "homework party." This is completely optional. GSIs will be present in shifts as will some readers. Students are expected to help each other out, and if desired, form ad-hoc "pickup" homework groups in the style of a pickup basketball game.

Homework Grading

The primary way that the homework will be graded is by yourselves. Homework is always due Wednesdays at 17:00. You need to turn in both your code in the form of an ipynb file and a .pdf file consisting of your written-up solutions that also includes a "printout" of your code.

After the HW deadline, official solutions will be posted online and then you will be expected to read them and enter your own scores and comments for every part of every problem in the homework on a simple coarse scale:

0 = didn't attempt or very very wrong,
2 = got started and made some progress, but went off in the wrong direction or with no clear direction,
5 = right direction and got half-way there,
8 = mostly right but a minor thing missing or wrong,
10 = 100% correct.

Note: all partial credit must be justified with a comment. If you are really confused about how to grade a particular problem, you are given a limited number of "I don't know" skips that you can use on every assignment. You always get at least two, and more if the HW has lots of parts. This is not supposed to be a stressful process and the skips are there to let you not obsess about how to grade any one part.

Your self-grades will be due Friday at 23:59 after the homework deadline and if you don't properly enter any grades by the self-grading deadline, you are giving yourself a zero on that assignment. Just doing the homework is not enough, you have to do the homework, turn it in on time, read the solutions, do the self-grades, and turn them in on time. Unless all of these steps are done, **you get a zero for that assignment**. We will be dropping your lowest-scored homework from your final grade calculation, so getting a single zero on a HW is not the end of the world.

Just as we encourage you to use a study group for doing your homework, we strongly encourage you to have others help you in grading your assignments while you help grade theirs. This will also help you avoid self-favoritism.

The readers are going to be grading and sending you occasional comments. Because we have reader grades, we will

Just as we encourage you to use a study group for doing your homework, we strongly encourage you to have others help you in grading your assignments while you help grade theirs. This will also help you avoid self-favoritism.

The readers are going to be grading and sending you occasional comments. Because we have reader grades, we will catch any attempts at trying to inflate your own scores. This will be considered cheating and is definitely not worth the risk. Your own scores will be used in computing your final grade for the course, adjusted a bit by taking into account reader scores so that everyone is effectively fairly graded on the same scale. (E.g. If we notice that you statistically tend to shade 8s into 5s a bit much as compared to the readers looking at your homeworks, we will apply a correction to pull your scores up a bit.)

If you have any questions, please ask on Piazza.

Extra credit will be available for many creative activities including helping us debug issues with the class and coming up with constructive solutions. (For example: creating practice problems with solutions, providing patches to bugs in labs and homeworks, etc...) Talk with your GSI in person or post on Piazza if you want to get feedback from the entire class.

Course Communication

The instructors and TA will post announcements, clarifications, hints, etc. on Piazza. Hence you must check the EE16B Piazza page frequently throughout the term. (You should already have access to the EE16B Spring 2017 forum. If you do not, please let us know.) If you have a question, your best option is to post a message there. The staff (instructors and TAs) will check the forum regularly, and if you use the forum, other students will be able to help you too. When using the forum, please avoid off-topic discussions, and please do not post answers to homework questions before the homework is due.

If your question is personal or not of interest to other students, you may mark your question as private on Piazza, so only the instructors will see it. If you wish to talk with one of us individually, you are welcome to come to our office hours. Please reserve email for the questions you can't get answered in office hours, in discussion sections, or through the forum.

It can be challenging for the instructors to gauge how smoothly the class is going. We always welcome any feedback on what we could be doing better. If you would like to send anonymous comments or criticisms, please feel free to use an anonymous remailer like this one to avoid revealing your identity.

Collaboration

You are encouraged to work on homework problems in study groups of two to four people; however, you must **always** most students can distinguish between helping other students and cheating. Explaining the meaning of a question, discussing a way of approaching a solution, or collaboratively exploring how to solve a problem within your group is an interaction that we strongly encourage. But you should write your homework solution strictly by yourself so that your hands and eyes can help you internalize this material.You should acknowledge everyone whom you have worked with or who has given you any significant ideas about the homework. This is good scholarly conduct.

Don't Be Afraid to Ask for Help

Are you struggling? Please come talk to us We would much rather deal with misunderstanding early on, and we can help. Even if you are convinced that you are the only person in the class that doesn't understand the material, and that it is entirely your fault for having fallen behind, please overcome any feelings of guilt and ask for help as soon as you need it -- we can almost guarantee you're not the only person who feels this way. Don't hesitate to ask us for help -- we really do care that you learn!

Advice

The following tips are offered based on our experience.

Do the homeworks! The homeworks are explicitly designed to help you to learn the material as you go along. Although the numerical weight of the homeworks is not huge, there is usually a strong correlation between homework scores and final grades in the class.

Take part in discussion sections! Discussion sections are not auxiliary lectures. They are an opportunity for interactive learning. The success of a discussion section depends largely on the willingness of students to participate actively in it. As with office hours, the better prepared you are for the discussion, the more you are likely to get out of it.

Form study groups! As stated above, you are encouraged to form small groups (two to four people) to work together on homeworks and on understanding the class material on a regular basis. In addition to being fun, this can save you a lot of time by generating ideas quickly and preventing you from getting hung up on some point or other. Of course, it is your responsibility to ensure that you contribute actively to the group; passive listening will likely not help you much. And recall the caveat above that you must write up your solutions on your own. You are strongly advised you to spend some time on your own thinking about each problem before you meet with your study partners; this way, you will be in a position to compare ideas with your partners, and it will get you in practice for the exams. Make sure you work through all problems yourself. Some groups try to split up the problems ("you do Problem 1, I'll do Problem 2, then we'll swap notes"); not only is this a punishable violation of our collaboration policies, it also ensures you will learn a lot less from this course.