We will start at 9:40.

*If you’re bored, talk to your neighbor about their favorite summer activities, or about their favorite fruits.*
Humans of EECS 16A
Instructors

Tiffany Chien
(she/her)

Nathan Brooks
(he/him)

Anvitha Kachinthaya
(she/her)

EECS Faculty Contributors to 16A: Vladimir Stojanovic, Anant Sahai, Gireeja Ranade, Ali Niknejad, Claire Tomlin, Michel Maharbiz, Miki Lustig, Vivek Subramanian, Thomas Courtade, Babak Ayazifar, Ana Arias, Laura Waller, Rikky Muller
Staff

Thomas Chen (Discussion/Content)
Joyce Zhu (Head Lab)
Amy Song (Discussion)
Jack Kang (Lab)
SooHyuk Cho (Tutor)
Alexander Di (Lab ASE)
Kapil Malladi (Lab ASE)
Anish Dhanashekar (Lab ASE)
Oscar Tapia Gallegos (Lab ASE)
EECS Departmental Staff

Course Manager
Great resource for 1-on-1 concerns
krystle@eecs.berkeley.edu

Krystle Simon
Which of the following student identities apply to you?

21 responses

- High school student: 4 (19%)
- Transfer student to Cal: 1 (4.8%)
- International student: 5 (23.8%)
- (incoming) first year at Cal: 2 (9.5%)
- (incoming) second year at Cal: 9 (42.9%)
- (incoming) third year at Cal: 2 (9.5%)
- (incoming) fourth year at Cal: 1 (4.8%)
There are many different kinds of people in this class.

Dogs or cats?

26 responses
You all are starting from different places.

What is your experience with circuits? (note: none is expected for this course)

23 responses

- 52.2% No exposure to circuits
- 26.1% Some exposure to circuits, perhaps in a physics class
- 21.7% Have taken a circuits-focused course
And care about different things in life.

How do you feel going into this course?

23 responses

Not looking forward to it

1 (4.3%)

0 (0%)

5 (21.7%)

5 (21.7%)

12 (52.2%)

Really excited!
All of you deserve to be here and to be supported.

Together, all of you and our course staff are the creators of our course culture.

We all have the power to make other people feel welcome (or not).

We expect you to bring respect, openness, and kindness to everyone.

We expect you to help out and support each other.

*We are not here to show off or prove how smart we are (please).*
What are you all excited about?

- Hands-on labs!
- Building circuits!
- Math!
- New knowledge!
- Meeting new people!
- What is electrical engineering?
- How theory leads to applications!
- Connecting linear algebra and circuits!

Yay!
What are you all nervous about?

- Heard this class is tough
- Not knowing enough about math or EE
- Workload
- Learning new things
- First Berkeley class
- Homework
- Grades
- Exams
- Stressssss

This class will be hard and new for many of you! But you are not alone.
Make a friend

Introduce yourself to one person near you that you don’t know.

● What are some hobbies you enjoy?

Exchange contact information so you can work together on assignments!
Course Logistics and Policies
Parts of the course

- Lecture
- Discussion
- Lab
- Homework
- Office hours, homework party
- Exams

All details of policies are listed out in syllabus! [https://eecs16a.org/policies.html](https://eecs16a.org/policies.html)
Lecture (M/Tu/W/Th)

We expect everyone to come to live lecture.

Popcorn 🍿! Lecture quizzes once a week on a random day. You can work with your neighbors and ask us questions.

- If you must miss lecture, you can watch the recording and submit the popcorn within 24 hours.

The course moves very fast in the summer!
Supplements lecture. Like a textbook, written specifically for this course.

Website will link relevant notes for each lecture

Sometimes we need things explained to us another way!
Discussion (M/Tu/W/Th)

TAs review that day’s lecture material and you work on problems with each other.

A lot of learning happens in discussion!

Attendance taken. Attend 16 out of 25 sessions for full credit.

Discussion **starts today**: 11-12 or 12-1 in Cory 540AB

- Two different TAs — try out both to see whose style you like
Lab (Tu/Th)

This course’s design is motivated by real-world applications — you explore these in lab!

Lab starts next week. (2-5pm and 5-8pm in room Cory 140)

You must attend the lab section you are officially enrolled in.

Finishing lab and being checked off is part of your grade. There will be a chance to make up missed labs. More details in syllabus.
Homework

One per week, due on Friday night.
● First HW is now available on the website. It’s due this Friday!
● Covers material up through Wednesday’s lecture

Gradescope

HW is self graded + staff graded
● If you score >80%, then you receive 100% credit
● You must self-grade to receive full credit

Slip days, hw drops

Work with study group!
Office hours (OH) and Homework Party

Instructor OH: Mon 1-2pm + Wed 3-4pm in Cory 144MA.

- Ask questions about lecture or course content
- Hang out and get to know instructors :)
- Ask questions about Berkeley and about life

Homework Party: Fridays 10-12 in Cory 144MA

- Work with other students on homework! 16A Staff will be around to help too

Ed ([https://edstem.org/us/courses/40181/discussion/](https://edstem.org/us/courses/40181/discussion/))
Academic Dishonesty

We take academic dishonesty very seriously.
There will be harsh consequences!

When in doubt:

- Write up your own work
- Don’t copy other people’s work
- Don’t look at solutions
Exams

Dates:

- Quest: **Monday, July 10, 2023, 9:30am-11am** (2040 VLSB)
- Midterm: **Monday, July 24th, 2023, 5pm-7pm** (145 Dwinelle Hall)
- Final: **Wednesday, August 9th, 2023, 6pm-9pm** (2040 VLSB)

Put these in your calendar today!

If you need to request an alternate time for any exam, you must email **eecs16a@berkeley.edu** by **THIS FRIDAY, June 30, 2023.**
Grading

<table>
<thead>
<tr>
<th>Category</th>
<th>Points (out of 300)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture Participation</td>
<td>5 points</td>
</tr>
<tr>
<td>Discussion Attendance</td>
<td>5 points</td>
</tr>
<tr>
<td>Homework</td>
<td>45 points</td>
</tr>
<tr>
<td>Labs</td>
<td>45 points</td>
</tr>
<tr>
<td>Quest</td>
<td>40 points</td>
</tr>
<tr>
<td>Midterm</td>
<td>60 points</td>
</tr>
<tr>
<td>Final</td>
<td>100 points</td>
</tr>
</tbody>
</table>

EECS 16A Grade Breakdown

- Lecture Participation: 5 points (33.3%)
- Discussion Attendance: 5 points (15%)
- Homework: 45 points (20%)
- Labs: 45 points (15%)
- Quest: 40 points (13.3%)
- Midterm: 60 points (20%)
- Final: 100 points (15%)
Accommodations

- Disabled Students Program: make sure letters are uploaded ASAP
  - More information about DSP [here](#)
- We are here to help and support you!
Communication

- **Ed** will be our primary mode of course communication
  - Check frequently for announcements!
  - Post content questions on Ed

- For personal or private questions or concerns, please email
  - [eecs16a.homework@berkeley.edu](mailto:eecs16a.homework@berkeley.edu): homework-related questions
  - [eecs16a.lab@berkeley.edu](mailto:eecs16a.lab@berkeley.edu): lab-related questions
  - [eecs16a@berkeley.edu](mailto:eecs16a@berkeley.edu): logistical or administrative questions, emergencies, conflicts, accommodations, etc.
How to succeed in this course!

Actively listen and participate in lecture, discussion, and lab.

Keep up with the material - catching up is hard!

Come to office hours and homework party - we don’t expect you to do this without support from us!

Work with other students!!

Sleep, take care of your mental health, and remember that your grades aren’t everything.
What will you learn in this class?
16A and 16B introduce the field of EE(CS)

**Real World**
- Imaging:
  - EE 16A

**Measurement**
- Measurement circuits

**Processing**
- Systems of linear equations
- Matrix analysis
- Processing circuits
- Cross-correlation Optimization

Take action

Self-Driving Car
EECS 16A is split into three modules

1. Introduction to Systems
   - How do we collect data? Build a model?
   - Foundations of linear algebra
   - Application: Imaging

2. Introduction to Circuits and Design
   - How do we use a model to solve a problem?
   - Application: Touchscreens

3. Introduction to Signal Processing and Machine Learning
   - How do we “learn” models from data, and make predictions?
   - Application: Positioning (GPS)
Let’s do this!
Before we had medical imaging...
Now:

How can we slice without slicing?!
Imaging = measuring how an **energy source** interacts with a **material**.

Humans are pretty opaque to visible light...

Energy source

Interaction with material = absorption, reflection, etc.
... but humans are translucent to X-rays!

X-ray source

Measured interaction = how much X-ray gets through different materials
How do we get 3D from 2D images?

Take shadows from many directions!

These are called projections.

Now how do we actually solve for the 3D?
We need a **model** for this system.

Make the problem simple first: 2D object with only 4 “pixels”

And name some variables.

Unknown object to solve for

What do the pixels represent? How many unknowns do we have?

What measurements could we take to help us solve?
Tomography!

Let’s connect the knowns (measurements) and unknowns with some equations.

**Unknown** object

**Tomographic projection:** known measurements
Tomography!

Let’s connect the knowns (measurements) and unknowns with some equations.

\[ y_1 = x_1 + x_2 \]

OR \[ = x_1 \times x_2 \]

OR \[ = e^{x_1+x_2} \]

Unknown object

Tomographic projection: known measurements

Depends on the physics! This will just be a *model*.

We will choose the easiest one here (which turns out to be useful in many cases).
How can we **model** this imaging system?

Another angle:

Do I sense a system of equations?

\[
\begin{align*}
y_1 &= x_1 + x_2 \\
y_2 &= x_3 + x_4 \\
y_3 &= x_1 + x_3 \\
y_4 &= x_2 + x_4
\end{align*}
\]

How many measurements do we need to take?

Does the system have a unique solution?
We built a model that perhaps we know how to solve!

To be continued...