ECE at CMU - Next Steps

Your Friendly Neighborhood 18-100 TAs :)

Plan For Today

- Overview of ECE Areas
- Other ECE Requirements
- IMB Program Explainer
- TA Tips and Tricks
- Comprehensive List of Resources
- Q&A + Activity

Blank Visual Planner Sheet

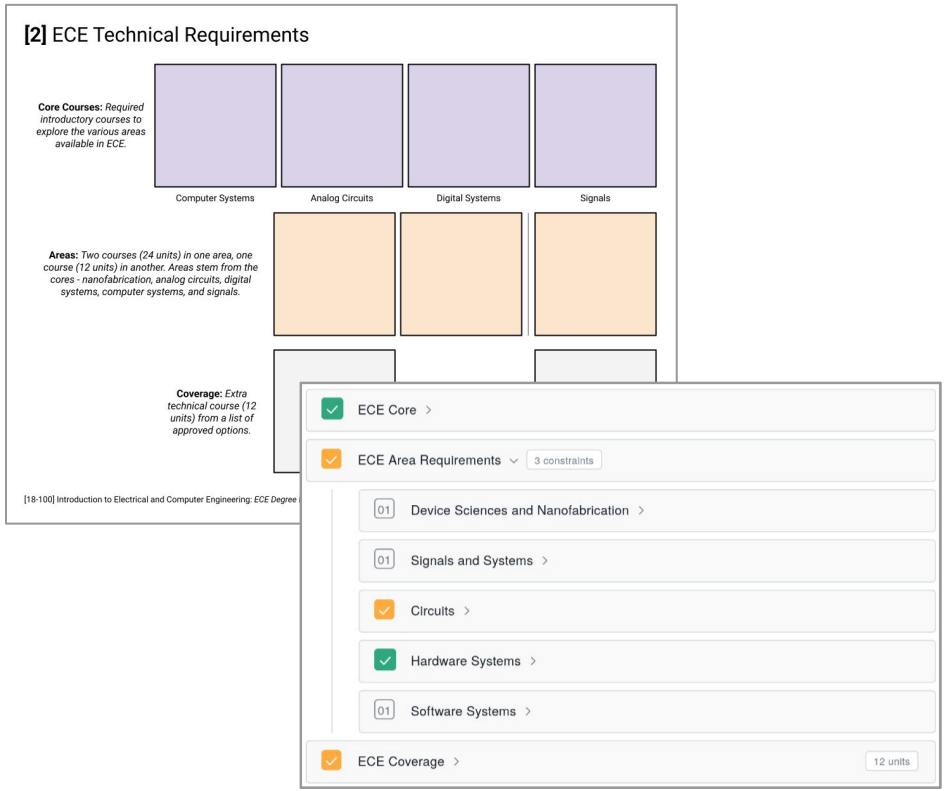
Example In-Progress Planner Sheet

Stellic Degree Planner

Click These!

ECE Cores + Areas - An Overview

- 4 required core classes
    - Introduction to fundamentals in each area in ECE
    - 1 primary professor, rotating support professor
- Areas stem from cores:
    - Area I: 2 classes
    - Area II: 1 class



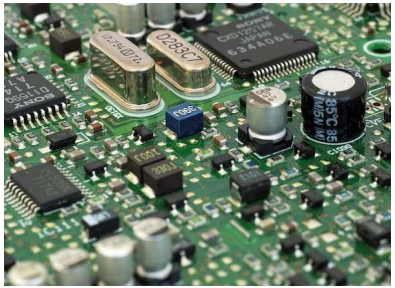
ECE Core Classes - From 18-100

Broad introductions to the various areas of ECE

Computer Systems (18-213)

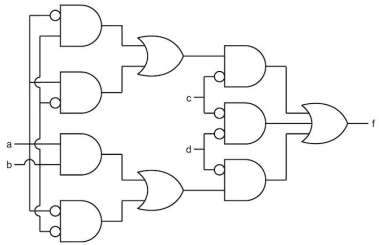
I2C Lab
Crypto Lab

(15-122 Prerequisite)



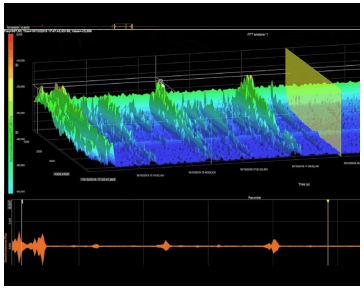
Analog Circuits (18-220)

Basic Circuits Lab
MOSFET Lab
555 Timer Lab
Op-Amp Lab
ADC Lab



Hardware Design (18-240)

MOSFET Lab
Adder Lab



Signals (18-290)

ADC Lab
Radio Lab
Machine Learning Lab*

<u>Some</u> can be taken together. Take in order of what you liked in 18-100!

Software Systems Area (18-213)

Professor Greg Kesden

"Programmer's view on how computers execute programs, store data, and communicate"

Labs: Cache, Memory Allocator (Malloc), Shell, Proxy, etc.

Some Area Courses:

- Computer security (18-330)
- **Embedded Systems (18-349)**
- Hardware/Software Interface (18-344)
- Computer Networks (18-441)

- Operating Systems (15-410)***
- Compiler Design (15-411)
- **Parallel Computer Architecture (15-418)**
- Distributed Systems (15-440)
- *Many, many more!*

See Stellic/course catalog for more details!

Analog Circuits Area (18-220)

Professor Mark Budnik

“Fundamental topics common to a wide variety of electrical engineering devices and systems”

Labs: Power Supplies, IR Transmitter, Inductor Coils, etc.

Area Courses:

- **Microelectronic Circuits (18-320)**
- Analog ICs (18-4/621)
- **Digital ICs (18-4/622)**

Other Interesting Courses:

- IoT Tapeout (18-420)
- Advanced Analog ICs (18-721)
- **Advanced Digital ICs (18-5/725)**
- RF ICs (18-723)
- Radiation-Hardened ICs (18-729)

See Stellic/course catalog for more details!

Nanofabrication Area (18-220)

Professor Jimmy Zhu

18-220 prerequisite, but separate area

Area Courses:

- Electromagnetics (18-300)
- **Semiconductors (18-310)**
- Electromagnetics (18-401)
- Microfabrication Methods (18-403)
- Nano-Bio-Photonics (18-416)
- Semiconductor Applications (18-419)

Other Interesting Courses:

- HackerFab (18-410)

See Stellic/course catalog for more details!

Hardware/Digital Logic Area (18-240)

Professor Bill Nace

“Basic issues in design and verification of modern digital systems”

Labs: VGA Video Games, RISC-V Processor, etc.

Area Courses:

- Hardware for Machine Learning (18-340)
- **Design Verification (18-341)**
- Hardware/Software Interface (18-344)
- **Computer Architecture (18-447)**

Other Interesting Courses:

- Tiny Tapeout Chip Design (18-224)
- Modern Computer Architecture (18-740)

See Stellic/course catalog for more details!

Signals Area (18-290)

Professor Tom Sullivan

“Mathematical foundation and computational tools for processing continuous and discrete time signals”

No Labs*

Some Area Courses:

- **Controls (18-370)**
- Electrical Power Systems (18-372)
- Nano/Micro Biomedical Devices (18-418)
- Machine Learning for Engineers (18-461)
- **Digital Signals Processing (18-491)**
- Image and Video Processing (18-793)

See Stellic/course catalog for more details!

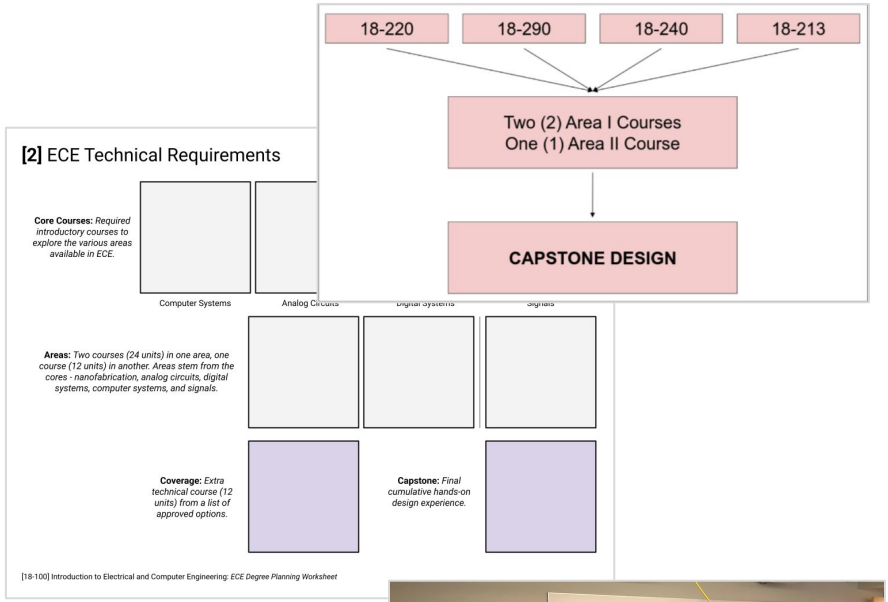
Coverage and Capstone

Coverage: 300+ ECE class, or from select list *(see ECE academic guide)*

Capstone: Hands-On Design Project

ECE Design Experience (18-500)
Advanced Digital IC Design (18-525)*
Rapid Computer Systems Prototyping (18-540)*
Mechatronic Design (18-578)*

**only offered in Spring*



Math and Science Requirements

ECE Math (18-202)

- OR -

Two of the Following:

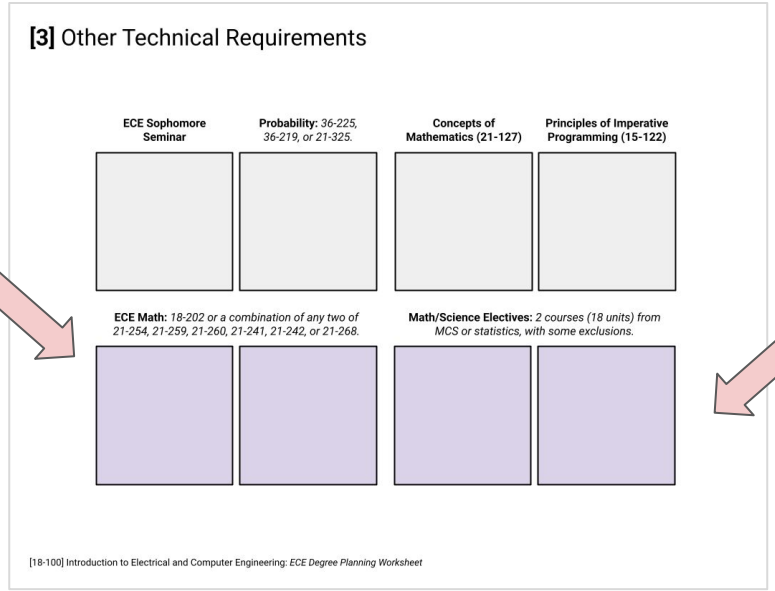
Vector Calculus (21-254)

3D Calculus (21-259)

Differential Equations (21-260)

Matrices (**21-241**/21-242)

Multidimensional Calculus (21-268)



Any 2 Math or Science Classes

(With Some Restrictions)

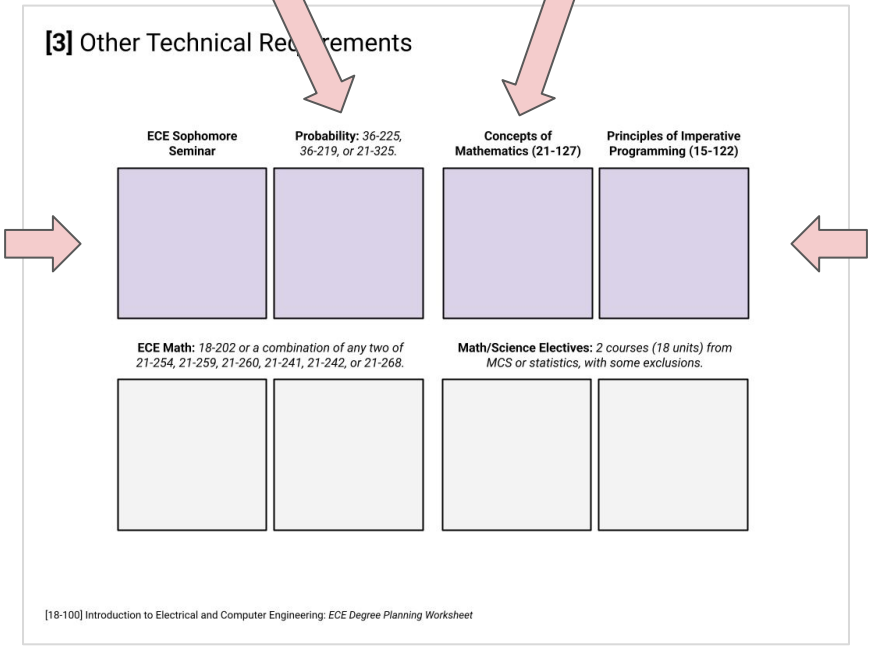
Other Technical Requirements

Probability Requirement
(36-225 **fall only*, 36-219 **spring only*, 21-225)

Concepts (21-127)

ECE Skills Seminar (18-200)

Imperative C Programming (15-122)



First-Year CIT Requirements

Intro Engineerings: 18-100 + something else

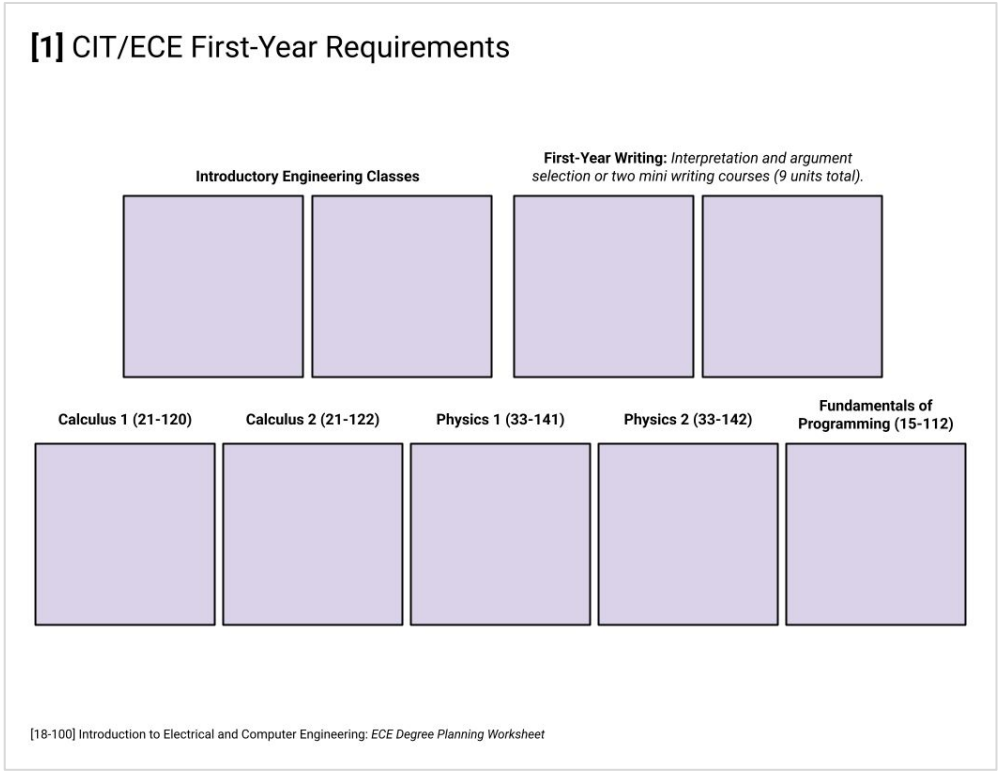
First-Year Writing: Interpretation and Argument or 2 Writing Minis

Calculus 1 (21-120), Calculus 2 (21-122)

Physics 1 (33-141), Physics 2 (33-142)

Fundamentals of Programming (15-112)*

*If you *test out* of 15-112, you must take at least 9 units of some "higher level" 15-XXX class



General Education Requirements

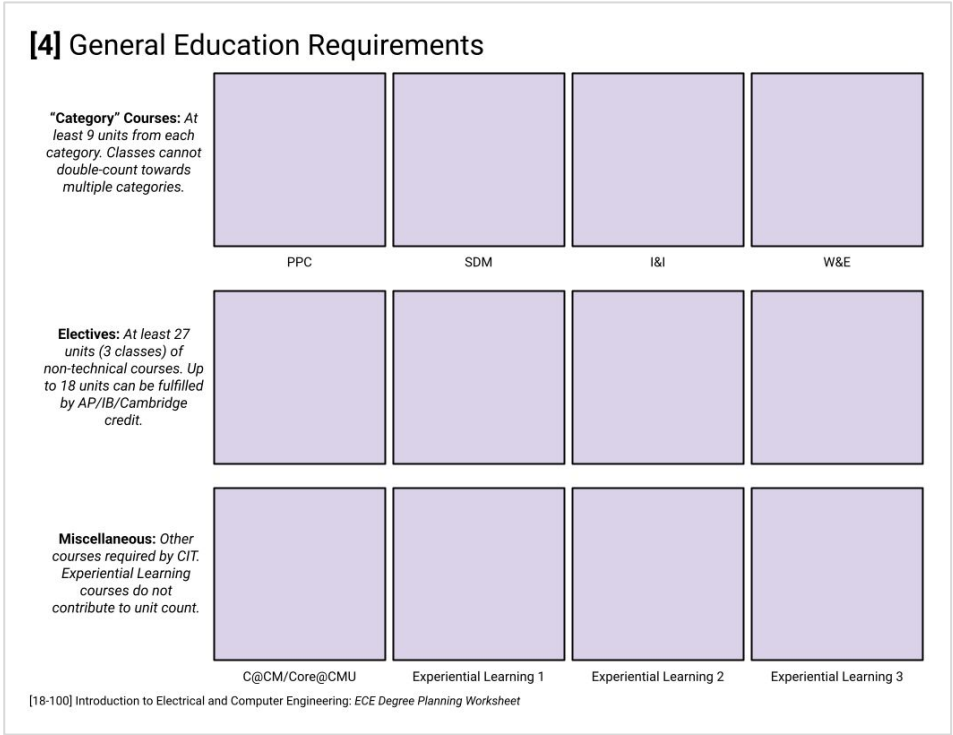
Category Gen-Eds: 9 Units Class From:

- People, Places, Cultures (PPC)
- Social Analysis, Decision Making (SDM)
- Innovation, Internationalization (I&I)
- Writing and Expression (W&E)

Electives: 27 Units of Non-Technical Courses

C@CM, Experiential Learning I, II, III

Free Electives: Needed to Achieve 379 Units



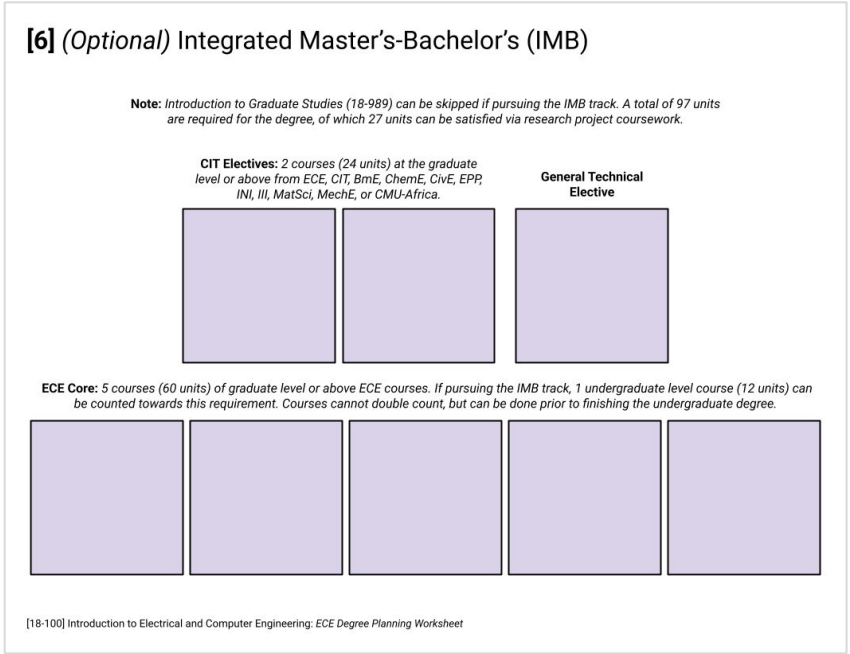
IMB (Integrated Master's Bachelor's) Program

Complete your Bachelor's and Master's degrees in ECE at the same time!

- Most students do 4+1 years

Requirements:

- **≥ 3.0 QPA***, 2nd semester junior or senior year
- **8 extra courses for Master's degree**
- **Courses cannot double count**
  - Single 300+-level ECE class can be counted towards graduate degree



TA Tips and Tricks

For sophomore year:

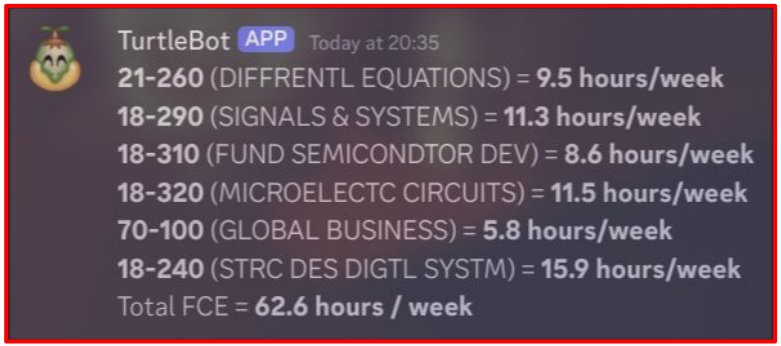
- Make friends in common classes → concepts, ECE cores, etc.
- Find the areas of ECE you do and don't like
- Try out cores you're interested in!
    - Prioritize cores you think you'll enjoy → unlocks higher-level classes
- Survive!
    - Generally limit yourself to 2 - 3 technical classes
    - Make sure to have time to experience college
- Apply to be an 18-100 TA! :)

TA Tips and Tricks: Overloading

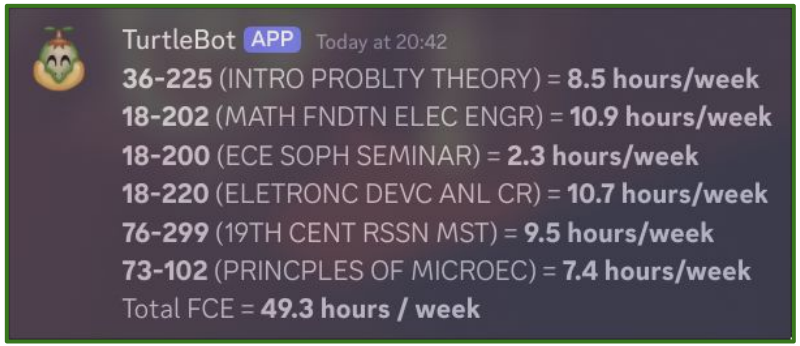
<u>You do not need to overload to graduate on time!</u>

- You do not need to overload to graduate on time. You do not need to overload to graduate on time.
- **379 (*Minus AP Credits) Units/8 Semesters → 47.375 Units/Semester**
- More important to learn in classes and be happy than to stress and graduate early.

Utilize FCEs, Discord TurtleBot, friends, advisors, etc. to help determine if schedules are feasible.



<u>Unreasonable and Tortuous</u>



Much more doable!

TA Tips and Tricks: Internships and Research

Getting Internships can be Hard

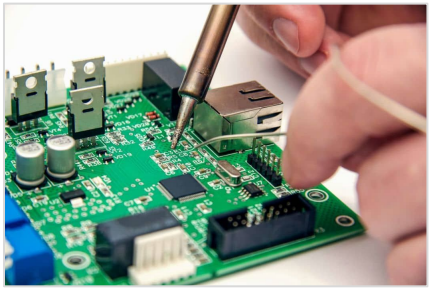
- Freshmen and Sophomores generally struggle to find positions
  - CPDC is useful for improving applications + aligning expectations
- Not getting an internship isn't the end of the world, plenty of time for work later :)

Alternative Summer Plans:

- Research → ask professors you are close to about what you might work together on
  - Can be paid!
  - Can count as letter-grade units (coverage)!
- 18-213, 15-122, 21-127, 33-142 offered as summer courses

TA Tips and Tricks: Pass/Fail Classes

Up to 9 units of pass/fail credit can be counted towards your degree!



18-021: PCB Fabrication

Professor Jim Bain

18-059: Amateur Radio

Professor Tom Zajdel

98-XXX: StuCo

Student-Run Courses

69-XXX: P.E.

Get Some Exercise!
Touch Grass!

Semi-Comprehensive List of Other Resources

Stellic Degree Planner	**Faculty Course Evaluations**
ECE Academic Guide/Requirements Page	**CIT Advisors**
List of All ECE Courses	**ECE Advisors**
ECE Peer Advisors	**Ask during OH / Post Questions to 18-100 Piazza > Course Planning**

See also: Previous (F24) Edition of the Choosing Courses in ECE Recitation Presentation

How Did We Do? + Anonymous Q+A