# ENR355 Robotics and Sensors

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Spring 2026

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# What skill sets do I need for robotics?

- It depends.

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# What skill sets do I need for robotics?

Careers at Apple

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## Firmware Engineer - Camera

Cupertino, California, United States
Hardware

Submit Resume

### Summary

Posted:Dec 10, 2025
Role Number:200628468-0836

Apple's Camera Firmware team is looking for an extraordinary firmware engineer to drive groundbreaking technologies for Apple products! As part of the team you would work on core camera/ISP/Machine learning technologies, including Apple crafted Image signal processing pipeline and HW components, where you will have the chance to define the way that Apple develops, tests and manufactures all of its products. Our close-knit team champions an environment of product innovation, rapid product iteration and collaboration at both team and multi-functional levels with a liberating amount of autonomy!

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# What skill sets do I need for computational?

| | |
|---|---|
| Minimum Qualifications | • BS and a minimum of 3 years relevant industry experience<br>• A real passion for embedded software development<br>• Proficiency in C/C++<br>• Proficiency in development of multi-thread software within embedded RTOS system |
| Preferred Qualifications | • Familiarity with camera pipeline and HW components |

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# Maybe ENR355 is different from other courses:

- **No finals**, but we will build our own robotics from scratch.
- Your grade will mostly be based on your accumulated learning achievements and milestones in **hand-on** sessions..
- The milestones (for your grade) can be started since day 1, can be finished by mid-term.
- Everyone will take a major leading role in one section of the hands-on sessions (laser cutter, 3D printer, CNC, PCB design, circuits assembly, motors and actuators).
- The course will try to cover lots of weird-ass skills. It's OK if you hate (some of) them, but now it's the time to try and to know that you hate them.
- I would like everyone to have chance practicing slide-making and presentation, so:
  - Show me you are good at that can ***boost*** your grade.
  - Show me you are getting better at that can ***boost*** your grade.

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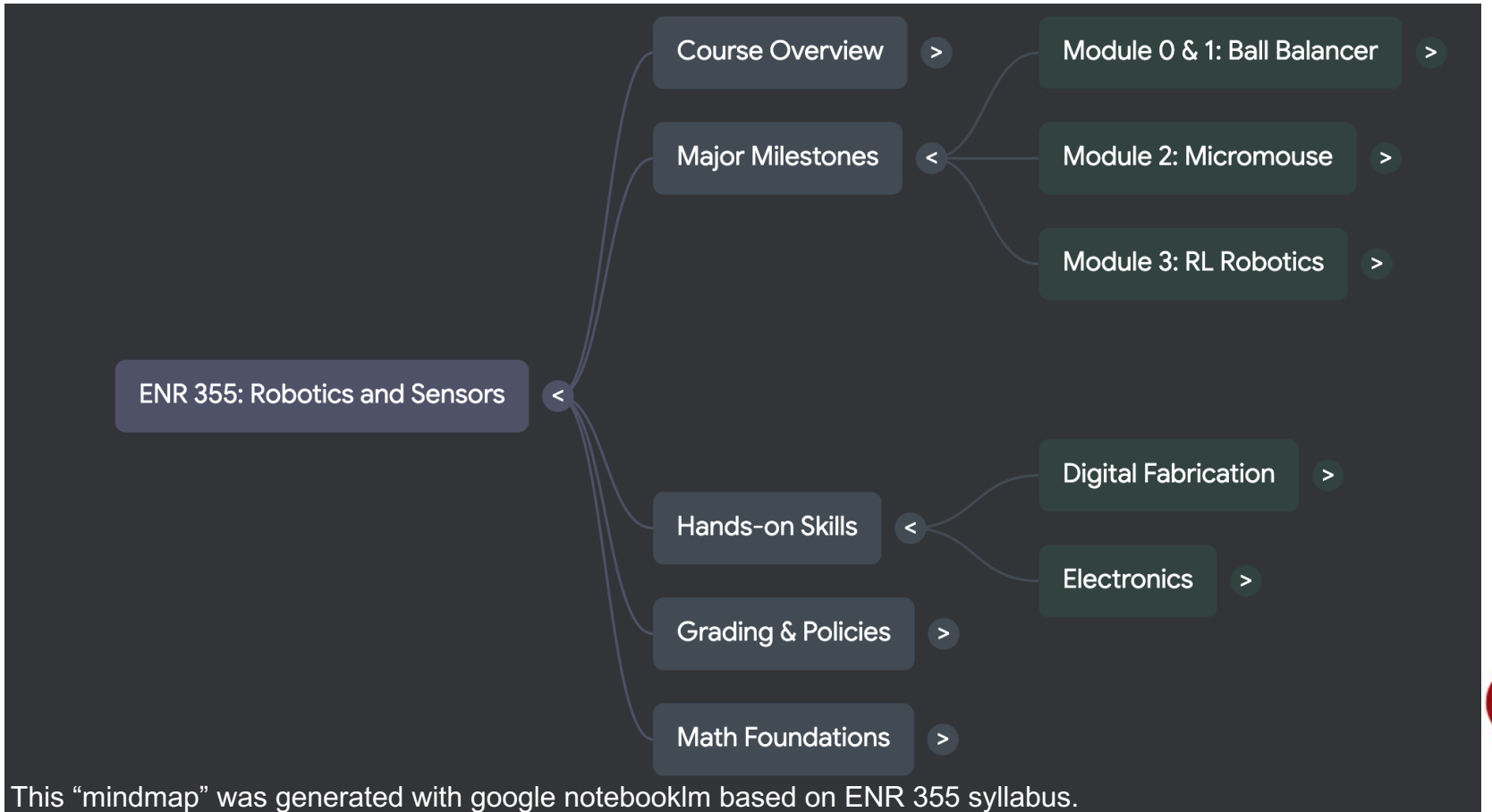
# Syllabus and course review:

- Moodle page: https://coewinmoodle.coe.edu/moodle/course/view.php?id=4724
- Course content page: https://xlicoe.github.io/ENR355/




This “mindmap” was generated with google notebooklm based on ENR 355 syllabus.

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# Rule-of-thumbs:

- Don’t spend more than 15-30 min getting stuck on a road block. (It’s time to get up.)
- Study group, AI tutor, notes taking service, testing center… getting all the helps you need.
- Self-learn is encouraged and expected.

- AI policy:
  - you understood and could explain any AI generated contents (that you submitted).
  - Don’t submit an AI generated idea as your own idea.
  - I cannot grade your efforts based on AI generated contents, but I can grade your efforts based on documentation, presentation, and the clear understanding of the AI tooling.

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# Assignments

- Upload at Moodle page: https://coewinmoodle.coe.edu/moodle/course/section.php?id=73781
- Submission templates: https://coewinmoodle.coe.edu/moodle/mod/resource/view.php?id=370114
- Sometimes I will ask proof-of-efforts and proof-of-success by screenshots. It will be very helpful if the screenshots are nicely formatted and part of the slides.
- Pre-labs are tasks for you to try and complete before the course contents. If most of us having trouble getting it done, we will cover it in class. Otherwise, it can save us time talking about the fun stuff.

# Example of pre-labs tasks:

- Get Google Colab and Python IDE of your choice. (If no prior experience, PyCharm is recommended).
  Colab: https://colab.research.google.com
  PyCharm: https://www.jetbrains.com/pycharm/
- Github: register an Github account https://github.com/ and try to join https://github.com/Coe-College
- CAD tool

Autodesk inventor, Autodesk Fusion or any tool of your choice.

Make a 3D Tesla valve based on following references:

- https://www.researchgate.net/publication/329154004_A_numerical_investigation_of_the_flow_of_nanofluids_through_a_micro_Tesla_valve

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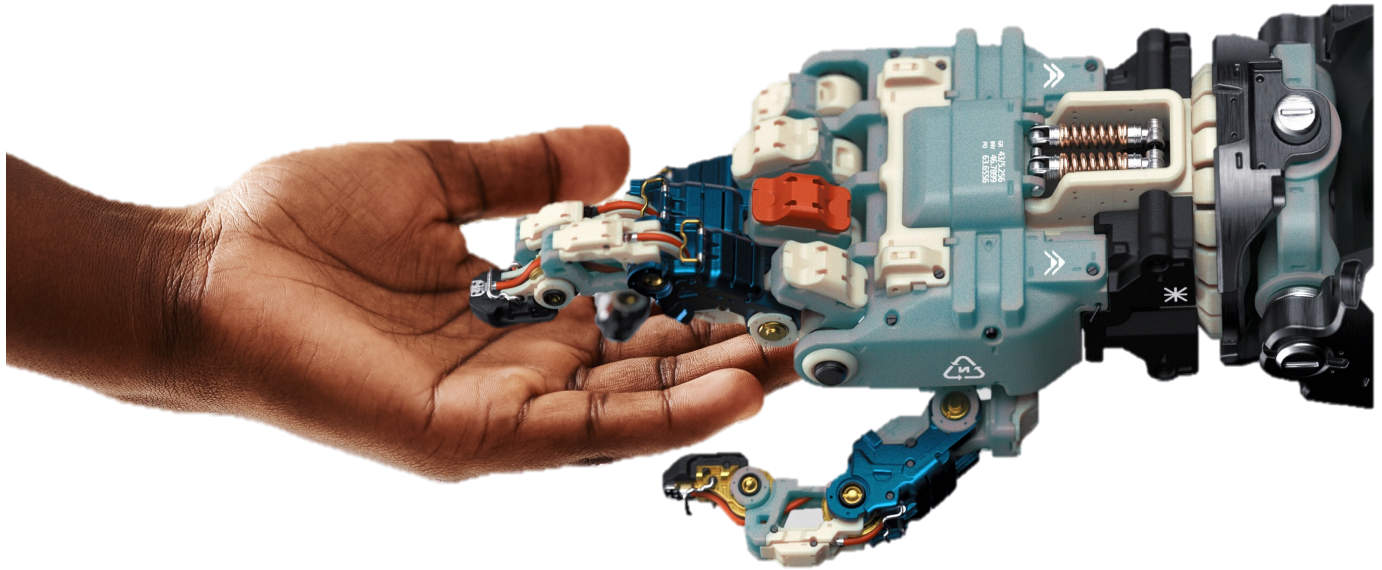
# No matter what your dream project will be, ENR355 is here to help!

Lab tour: let's visit all the fabrication resources.

Equipment booking: https://xlicoe.github.io/equipment_booking/



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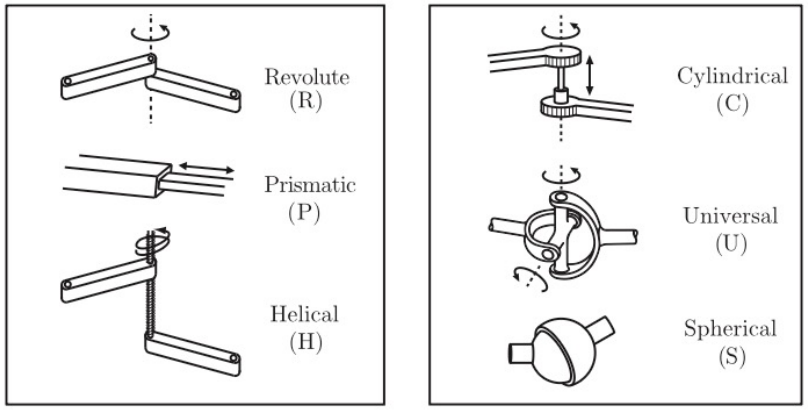
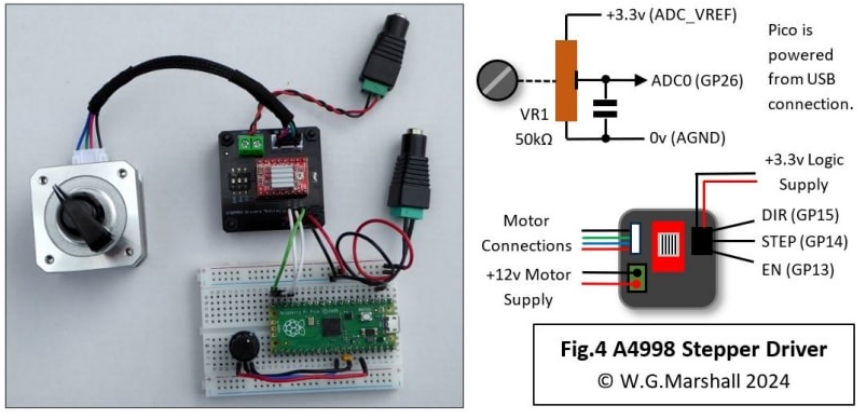
Human hand is ppt stock image
Robo hand artist: https://www.artstation.com/taksar

# Robotics core in this course:

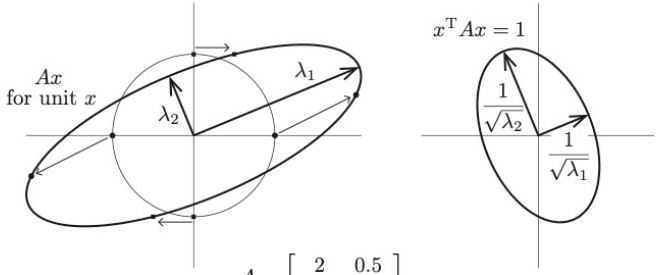
## Joints and Links




## Brain and Muscle




## Math

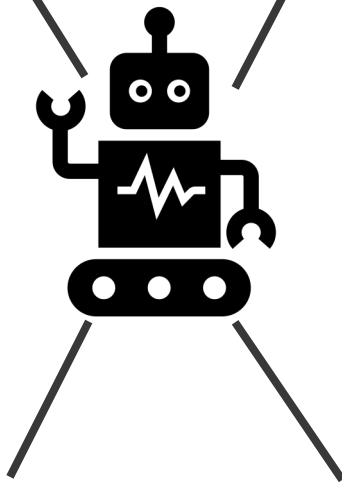



$$A = \begin{bmatrix} 2 & 0.5 \\ 0.5 & 1 \end{bmatrix}$$

$$v_1 = \begin{bmatrix} 0.92 \\ 0.38 \end{bmatrix}, \ \lambda_1 = 2.21$$

$$v_2 = \begin{bmatrix} -0.38 \\ 0.92 \end{bmatrix}, \ \lambda_2 = 0.79$$

$$A = QDQ^{\mathrm{T}}, \text{ where } Q = \begin{bmatrix} 0.92 & -0.38 \\ 0.38 & 0.92 \end{bmatrix} \text{ and } D = \begin{bmatrix} 2.21 & 0 \\ 0 & 0.79 \end{bmatrix}$$



## Digital twins and Simulation

**Isaac Lab: A GPU-Accelerated Simulation Framework for Multi-Modal Robot Learning**