UC Berkeley, EECS C106A: Introduction to Robotics

Final Project Partner FAQ

What material have students learned in the class?

EECS 106A is a mezzanine course geared towards upperclassmen undergraduates and early year graduate students in model-based robotics and control. It culminates in a large independent project which requires students to implement a substantial robotics system on hardware. Students have covered the following topics in class:

- Rigid Body Transformations
- Forward Kinematics
- Inverse Kinematics
- Fundamentals of Computer Vision (image formation, two-view geometry)
- Velocities, Twists, and Screws
- Motion Planning
- Lagrangian Dynamics
- Fundamentals of Control

In addition to the theoretical lecture material, students have also covered the following concepts in labs:

- Basics of using ROS Kinetic
- Forward and Inverse Kinematics with robots from <u>Rethink Robotics</u>
- Using sensors on mobile <u>Turtlebot 2s</u>
- Utilizing common packages such as tf2 and OpenCV

For further detail, please visit the <u>course website</u> for a survey of the topics covered in the course. Students are often willing to go above and beyond to learn new material and apply it to their projects.

What are the students' requirements for final projects?

All student projects must meet the following two requirements:

- Projects must include a hardware component
- Projects must include sensing, planning, and actuation

Students are also highly encouraged to work in groups of 4-5 this year.

Beyond this, the final project is entirely open ended.

What are some examples of previous projects?

Below are a selection of projects that received an A or higher in the course.

[Fall 2020] [Fall 2019] [Fall 2018] [Fall 2017] [Fall 2015]

What does the final project timeline look like?

Students submit their final project proposals at the end of October. They begin working on the project in parallel to their coursework through mid-November. At this point, there is no new course material, and students spend all their efforts on the final project.

As such, we'd love to give the students final project ideas by 10/06 if possible! That said, if you send a potential project idea after this date, we'll still pitch it to the students as an option!

They give final presentations in the first week of December and submit written reports in the second week of December.

Is there a guarantee that a partnered project will be fulfilled?

Unfortunately, we cannot guarantee that any project you propose will be picked by a group. We can say that students are usually eager to get facetime with industry partners though!

What resources are provided by the course for final projects?

Students have access to the course robots (Baxters and Sawyers from Rethink Robotics, Turtlebot 2s) and lab computers. Many students also have machines that can support virtual machines for work that need not be done in the lab. They additionally have a \$50 budget per team and can use any of the items on <u>this list</u> that have been purchased for previous final projects.

What have previous partnerships looked like?

Industry partners were introduced last year, so we don't have too much data to share! Historically, partners have posed small, bite-sized problems that their clientele would like addressed OR projects that need a proof-of-concept before diving in. For example, <u>Permobil</u>, an electric wheelchair company, noticed a need from their users for automated docking at tables, since achieving this manually requires a lot of coordination and dexterity.

Because EECS C106A is a design course, we would like to get our students to consider the bigger picture beyond just systems engineering. As such, it would be a great learning experience for students to engage with your customer groups to better understand their needs and pain points.

Students who work in industry- or research-partnered projects will likely need to meet with project partners once a week to discuss updates and address any roadblocks. For example, students who worked with Permobil sometimes required guidance from employees at Permobil on how to use their custom simulation packages.

Additionally, this is a great opportunity for companies to scout out talent! EECS C106A is one of the few undergraduate courses that gives such an in-depth review of model-based robotics theory and allows students to get hands-on experience working with robots.

We would like to avoid NDAs and similar privacy agreements. Students must present their work to other students and the teaching staff, as well as submit a final report in the form of a website. The goal is for them to be able to showcase their work in this class as they start searching for internships and full-time employment.

We are flexible to what your company's needs and wants are out of this partnership! Please let us know if you'd like to discuss any further.

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