

MECH&AE 162D/E Capstone Descriptions

Prof. Hong (Lecture 1 - Winter & Spring 2026) The goal of the course is to give the students a major design experience through a team-based design project. The students form teams (typically of 6 people) that you will work closely with to design, develop, analyze, and implement a product prototype. The product that the students build must be related to the Mechanical Engineering field, but can be from any of the sub-fields including but not limited to: Robotics, Manufacturing, Dynamics, Fluid Dynamics, Heat and Mass Transfer, Structural and Solid Mechanics, Systems and Control, or any combination of these fields. Besides teaching the necessary knowledge for you to complete the project and acquire relevant knowledge for practicing engineers, the lectures and labs will provide ample time for each team to have meetings with the instructor and TAs who will also be serving as consultants for your team.

Prof. Chang & Prof. Tsao (Lecture 2 & 4 - Winter & Spring 2026) 162D/E is a product design class spanning over the winter and spring quarters. In the very beginning of the Winter, a product's requirements in functions and sizes will be given to students. The instructor(s) will instruct and guide students to conduct a formal product design cycle from concept design, detail design, fabrication, testing to realization. Students also incorporate industrial standards, professional ethics, teamwork, and project management in the project activities. Overall, these sections are rigorously structured and aimed at instructing students in the ability and providing experience in the entire product design cycle. The lecture and lab activities include formal instructions, mostly in the first quarter, to fill the gaps between the capstone project and knowledge learned from the ME curriculum, e.g. sensors, actuators, programmable logic control software interfacing and integration, progress reports, demonstrations, and presentations throughout the two quarters.

In these sections, the products to be designed and realized are Autonomous Mobile Robots (AMRs), which perform autonomous maneuvers on a course and accomplish certain mechanical tasks by the manipulators on the mobile robots. Students design and build the mechanical system and learn to realize hierarchical robot control with real time software pipelines popular in the robotic industry: high-level logic control by Python codes using ROS2 (Robot Operating System) and low-level sensor/actuator control by C++ codes using interrupt driven prioritized task scheduling kernels.

Prof. Clites (Lecture 3 - Winter & Spring 2026) This is the mechanical engineering capstone course. In this section, we will focus on medical devices. Students will work in teams (ideally of 5) to develop a viable solution to a real clinical problem, by i) identifying and understanding a clinical need, ii) designing and refining a device to meet that need, iii) prototyping and validating the proposed device, and iv) communicating their process and results to a broad audience. This course is as much about the process as it is about the final product; topics include design thinking, prototyping, team management, regulatory considerations, fundraising, experimental design, and presentation skills. These topics are woven throughout the course lectures, in

parallel with a large-scale group project in which students will design and validate a real-life medical device.