

## **Improving design skills, critical thinking, and motivation through an introduction to mechanical design course**

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At Cal State LA in 2015 and 2016, faculty found that students within the mechanical engineering capstone design course were having difficulty with the design and manufacturing portion of the course. To better prepare the students for their capstone course, connect material in their second- and third-year courses to applications, and to increase student's motivation in engineering, we added ME 2030: Introduction to Mechanical Design. Within the new course students practice basic mechanics, the engineering design process, using computer-aided drafting software to design their projects and manufacturing their designs. These skills are applied to mechanical and hydraulic systems, connecting the material learned in their other courses to real systems. The hands-on nature of the course was also intended to increase student's desire to be engineers by allowing students to apply their knowledge to create systems to solve problems both in the course and throughout their undergraduate studies in the college's new Makerspace. During the pilot offering of the new course, students had very positive responses which has led many to volunteer to assist in teaching the course, to work in the Makerspace, and to many upper-class students taking the course when not required.

As this course has been taught over the past three semesters, it has been continually refined. One significant modification has been the addition of the student's first physics course in mechanics as a prerequisite. For students to be able to design mechanical components and systems, it is beneficial for students to have experience with kinematics, forces, free-body diagrams, torque, and energy principles that are introduced in physics. It will also greatly benefit the students to reinforce those mechanics concepts in a hands-on mechanical design course. The design of this course including the learning objectives, course structure, and sample assignments will be shared.