

California State University, Chico
Department of Mechanical and Mechatronic Engineering and Advanced Manufacturing

MECH/MECA 140: Introduction to Engineering Design

Section 03-04 M/W 9:00-10:50am
Instructor: Scott Vanni
Office Location: Physical: LANG 114
Zoom: link available in Blackboard Learn
Office Hour: Monday 11-12
Phone: (530) 898-5129
Email: svanni@csuchico.edu

Class Structure:

This course will be a blended instruction model with both virtual and in-person instruction. Attendance is required synchronously at the start of instruction independent of delivery type. Due to COVID-19 related issues, the course content, structure, grading, and delivery may need to be altered.

COVID-19 Face Mask Requirement

In compliance with the [California Department of Public Health](#) state mandate, Chico State requires that all students, staff, and faculty, wear a face covering in all indoor spaces on campus, including classrooms, labs, studios, and offices, and outside when physical distancing is not possible. Accordingly, all students are required to wear a face mask covering the nose and mouth in order to participate in this course. Failure to comply with this requirement will result in a referral to Student Conduct, Rights, and Responsibilities and disciplinary action being taken against you by the University.

Individuals unable to wear a face covering due to a medical condition should contact the [Accessibility Resource Center](#) by phone at (530) 898-5959 or by email at arcdept@csuchico.edu.

For more information about the state mandate, please visit the [Chico State COVID-19 News & Information](#) page.

Textbook and other supplies:

Required: Moaveni, Engineering Fundamentals, Thomson, 5th Ed
Your Physics book will also be a useful reference.

Course Description:

Through the process of designing and building a machine, you will learn a process for designing and essential project management skills. You will learn the basic systems used in most every machine such as sensors, pneumatics, hydraulics, bearings, bushings, gears, belts and pulleys, clutches and brakes, and framing materials. You will also get introduced to ac and dc motor control, simple electrical circuits, machine controllers, programming, testing and analysis of results. The class has an economic overlay in that the project(s) will include budgeting and feature justification. Labs are not recipe-type activities. They demand the student simulate the actions an engineer might take in considering automation of a machine or process, and then complete a proof-of-concept system to verify those decisions. Many of the project skills introduced here will be used in other projects in and out of classes, and especially in your capstone senior design project.

Prerequisites:

Corequisite: PHYS 204A.

Grading:

Homework	35%
Lecture based assignments/quiz	35%
Attendance	30%

*subject to change as COVID requirements change

Academic Integrity:

The students, faculty, administrators, and staff of CSU, Chico are committed to a culture of honesty in which members of the community accept responsibility to uphold academic integrity in all they say, write, and create. The complete CSU, Chico policy is available at: www.csuchico.edu/prs/EMs/2004/04-036.shtml. Review this policy and especially review the examples provided by the Office of Judicial Affairs of using previous work (plagiarism) and unauthorized collaboration, www.csuchico.edu/sjd/integrity.shtml. You can feel confident your instructor will protect the integrity of the class by taking appropriate action for any deviations from this policy of academic integrity.

Attendance:

You are allowed one class period of excused "sick leave" and one "wander in late". Otherwise attendance is required at all class meetings including during the scheduled final exam period. Your course grade will be lowered 1/3 grade point for each additional unexcused absence from class. Also, please get to class on time. Each additional "wander in late" = 1/2 of an absence.

Exams:

None planned.

Homework:

Will be typically due before class begins. Homework should be typed (except sketches, calculations, and diagrams which are to be done on engineering paper) and proofread. It will be graded on effort, content, spelling and grammar. Since this is a more project/lab-oriented course there will be plenty of out-of-class work you will need to do with your project team to accomplish each project. Generally, an average student during an average week should spend four hours per unit on a class. This includes time in class and time spent out of class doing homework and studying. Since this is a 2-unit class which meets four hours per week, on average you should devote at least 4 hours outside of class each week to this course. *COVID will require assignments to be submitted via Blackboard and subject to change.

Course Outline:

Week # (approximate)

1-2 Introduction to the design process

1. Project Justification (Why spend time or money on this project?)
2. Problem Definition - (What it must accomplish - define the specs)
3. Project Planning
4. Conceptualization
5. Evaluation of Alternatives
6. Detail Design and Analysis
7. Construction and Programming
8. Testing and Analysis of results

9. Communication of solution and give a "proof-of-concept" presentation iterative!

The groups will meet with a 'customer' to gather the technical details of a simple project. As you ask questions, constraints arise that lead to a simple system. Upon acceptance of your design, you receive the materials needed to build a proof-of-concept. You and your partner(s) must build it and demonstrate the project.

3-5 Design Project Mockup

6-7 Computer Control of Machines

8-15 Final Design Project

Lectures:

Lectures have been developed to address specific technical and economic issues. Interaction between the instructor and students is encouraged and expected. Lectures are scattered throughout the semester, as they become needed. The lectures are, in no particular order:

- Framing Material Choices
- Electrical Safety
- Machine Control Topologies
- Power Supplies
- I/O Circuits and Devices (Sensors)
- AC and DC Motors
- Gearing
- Belts and Pulleys
- Solenoids
- Bearings and Bushings
- Energy Sources
- Clutches and Brakes
- Couplers
- Motor Control (VFD's, Vector Drives)
- Asking Project Questions
- Pneumatics and Hydraulics in Machines
- Machine Controllers
- plus more...

Americans with Disabilities Act:

If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations. **Accessibility Resource Center**, 530-898-5959, Student Services Center 170, arcdept@csuchico.edu