

## Mechanical and Mechatronic Engineering (MECH/MECA) 140: Introduction to Engineering Design

Course Syllabus – Spring 2023

<b>INSTRUCTOR:</b>	Matthew Mione Campus Office: O'Connell 414 Campus Phone: 530-898-5374 <a href="mailto:mmione@csuchico.edu">mmione@csuchico.edu</a> Office Hours: MW 11:00 AM – 1:00 PM Additionally, by appointment in person or on Zoom. *Subject to change
<b>CLASS</b>	Section 01/02 - M/W 9:00 AM – 10:50 AM Section 05/06 - T/R 11:00 AM – 12:50 PM
<b>PREREQUISITES:</b>	MATH 119 or GE Mathematics/Quantitative Reasoning Ready, a score that meets department guidelines on a department administered calculus readiness exam for those who claim high school equivalence.

### 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.

### Course Usage of Blackboard Learn

Copies of the course syllabus and major assignments may be found on Blackboard Learn. You are responsible for regularly checking the online resources, which is accessed through the Chico State Portal at <http://portal.csuchico.edu>. Support materials for the course will be provided via the portal and it is expected that you will either have hardcopies or electronic access to the materials during in-class activities.

### Textbook and other supplies:

<b>Required:</b>	Moaveni, Engineering Fundamentals, Thomson, 5th Ed, ISBN: 978-1305084766 Amazon and Chegg.com both have it in eTextbook form.
<b>Recommended:</b>	Brown, Henry T., 507 Mechanical Movements, 2013 Ed, ISBN: 978-1614275183

Your Physics book will also be a useful reference.

## Communication

If you need to meet or contact me, please attend office hours or email. Please use my contact information listed on the first page to communicate, and do not go through the Blackboard channels. Email is by far the best way to get a hold of me.

In the event that I need to contact the class (schedule, assignment, etc.), it will be done via your university email account linked to the Portal. University policy requires students to monitor campus email accounts and it is suggested that you set up email forwarding if you have another preferred email account.

## Dropping and Adding

You are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. found <http://www.csuchico.edu/catalog/>. You should be aware of the deadlines and penalties for adding and dropping classes. I do not handle adding into the course, you need to see or email our MMEM Administrative Support Coordinator, Martha Layne ([mlayne@csuchico.edu](mailto:mlayne@csuchico.edu)), to do so. You are the only one responsible for dropping the class.

### Grading:

Homework	20%
Lecture based assignments/Quizzes	10%
Group Assignments & Presentation	15%
Final Project – Amount Completed	30%
Project Knowledge	10%
Individual Contribution & Teamwork	10%
Design Notebook	5%

\*Subject to change as COVID requirements change

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	F
	93.33	90.00	86.67	83.33	80.00	76.67	73.33	70.00	65.00	60.00	0.00

### 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:

There are no Tests.

### Quizzes:

There will be periodic quizzes on Blackboard related to and based on the material gone over that week in class.

### Homework:

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.

### **Submitted Work:**

Assignments are due at the beginning of a class and need to be ready to submit when the class starts. For handwritten work, engineering paper is required, and only the front of the page. Late or inappropriately submitted work is subject to grade reduction or not accepted at all. Most assignments will be submitted on Blackboard.

All work must have an appropriate heading including:

1. Assignment title
2. Your name
3. Date submitted

All typed work will be graded for spelling. Each spelling error will deduct one letter grade from that assignment. Spell check is simple to use, make sure to use it. There is spell check in Excel.

### **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.

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...

## **COVID-19 Information**

All students are required to complete their COVID-19 Vaccination Self-Certification by 8/15/2022. For additional information regarding this requirement please visit <https://www.csuchico.edu/coronavirus/vaccine-certification-student.shtml>.

Chico State may at any time require the use of an approved face covering which covers the nose and mouth in all indoor campus spaces and in order to participate in this course when in person. When face coverings are optional, they are always welcome on campus. You will be notified if face coverings are required.

Policies and requirements regarding COVID-19 are subject to change pursuant to campus, local, state and/or federal guidelines. Please note that dishonesty relating to the vaccination policy and/or your failure to comply with any COVID-19 related safety policy or mandate may result in disciplinary action against you through the office of Student Conduct, Rights and Responsibilities, which can include suspension or expulsion from the California State University system.

It is very important for students to contact the COVID-19 hotline if they become symptomatic, believe they have been exposed, or have tested positive for COVID-19. The hotline is (530) 898-2222 or [covidhotline@csuchico.edu](mailto:covidhotline@csuchico.edu).

## **University Policies and Campus Resources**

### **Academic integrity**

Students are expected to be familiar with the University's Academic Integrity Policy. Your own commitment to learning, as evidenced by your enrollment at California State University, Chico, and the University's Academic Integrity Policy requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Student Judicial Affairs. The policy on academic integrity and other resources related to student conduct can be found at: <http://www.csuchico.edu/sid/integrity.shtml>.

### **Campus Policy in Compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, 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. Students with disabilities requesting accommodations must register with the DSS Office (Disability Support Services) to establish a record of their disability.

Special accommodations for exams require ample notice to the testing office and must be submitted to the instructor well in advance of the exam date.

**IT Support Services (<http://www.csuchico.edu/itss>)**

The CAD lab with SolidWorks installed is located in OCNL 438. Other (non-CAD) computer labs for student use are located on the first and fourth floor of the Meriam Library, Room 116 and 450, Tehama Hall Room 131, and the Bell Memorial Union (BMU) basement.

**Student Services (<http://www.csuchico.edu/current-students>)**

Student services are designed to assist students in the development of their full academic potential and to motivate them to become self-directed learners. Students can find support for services such as skills assessment, individual or group tutorials, subject advising, learning assistance, summer academic preparation and basic skills development.

**Americans with Disabilities Act (<http://www.csuchico.edu/arc>)**

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](mailto:arcdept@csuchico.edu)

**Student Learning Center (<http://www.csuchico.edu/slc>)**

The mission of the Student Learning Center (SLC) is to provide services that will assist CSU, Chico students to become independent learners. The SLC prepares and supports students in their college course work by offering a variety of programs and resources to meet student needs. The SLC facilitates the academic transition and retention of students from high schools and community colleges by providing study strategy information, content subject tutoring, and supplemental instruction. The University Writing Center has been combined with the Student Learning Center.