California State University, Chico
College of Engineering, Computer Science, and Construction Management
Mechanical and Mechatronic Engineering and Advanced Manufacturing and Applied Robotics

AMAR-, MECA-, MECH440AW
Capstone Design I
Sections 01 & 02, Spring 2023

Instructor: David G. Alexander
Office location: O'Connell (OCNL) 422
Telephone: 898-6491
E-mail: dgalexander@csuchico.edu
Office hour: Wednesday 1:00 to 2:00 PM
Class days and times: Lecture (LEC): MW 12:00 PM – 12:50 PM
Presentations (SUP): Th 5:00 PM – 7:50 PM
Classroom: Langdon 300
Zoom available upon request only during scheduled class time (synchronous). Zoom will not be recorded.

Prerequisites: Completion of GE Written Communication (A2) requirement, MECH 200, and MECH 340

Recommended: CIVL 302, MECA 380, MECH 308, and MECH 338

Overview
Capstone Design I/II is the culminating course in a mechanical engineering, mechatronic engineering, and advanced manufacturing and applied robotics undergraduate degree. Students are assigned to cross-disciplinary teams and work on real-world projects for sponsors requiring hardware solutions. This course requires significant teamwork and communication throughout the semester with many stakeholders and participants. There is a lot of autonomy, however, students are supported by an assigned faculty advisor. Students are required to formally present the progress of their project three times throughout the semester. A final detailed design report is due at the end of the semester. The goal of Capstone Design I is to have a design completed and ready for fabrication that meets the sponsor’s requirements.
Course Description and Goals

Catalog Description
AMAR 440AW
Design methods applied to manufacturing systems in group design projects. Project definition, planning, and management. Design for manufacture, cost considerations, budgets, and teamwork. Oral and written presentation of design results. Initial stage of the capstone design project to be continued in AMAR 440B.

MECA 440AW
Design methods applied to mechatronic systems in group design projects. Project definition, planning, and management. Design for manufacture, cost considerations, budgets, and teamwork. Oral and written presentation of design results. Initial stage of the capstone design project to be continued in MECA 440B.

MECH 440AW
Design methods applied to mechanical systems in group design projects. Project definition, planning, and management. Design for manufacture, cost considerations, budgets, and teamwork. Oral and written presentation of design results. Initial stage of the capstone design project to be continued in MECH 440B.

2 hours lecture, 3 hours supervision. This is an approved Graduation Writing Assessment Requirement course; a grade of C- or higher certifies writing proficiency for majors. This is an approved Writing Course.

Course Goals

Student Learning Outcomes
1. Be able to apply design methods, incorporating multiple constraints and appropriate engineering standards, to mechanical, mechatronic, or manufacturing systems.
2. Contribute as a member of a multidisciplinary team to the overall success of the design project and participate in self and peer assessments, reflections, and design reviews.
3. Demonstrate progression from problem definition to conceptual design, to detailed design and complete a working hardware prototype that meets needs of an external sponsor.
4. Present findings orally and in writing.
5. Develop skills for effectively managing a team, communicating technical information, listening and collaborating, planning projects and tasks, budgeting, and managing project costs.
6. Understand professional ethical responsibility.
7. Recognize the need for, and acquire an ability to engage in lifelong learning.
Milestones

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponsor Presentations</td>
<td>2/2/2023</td>
</tr>
<tr>
<td>Project Proposal Presentations</td>
<td>3/2/2023</td>
</tr>
<tr>
<td>Preliminary Design Review</td>
<td>4/6/2023</td>
</tr>
<tr>
<td>Draft Design Reports Due</td>
<td>4/24/2023</td>
</tr>
<tr>
<td>Final Design Review Presentations</td>
<td>5/11/2023</td>
</tr>
<tr>
<td>Final Design Report Due</td>
<td>5/18/2023</td>
</tr>
</tbody>
</table>

How to Succeed in this Class

Practical advice for succeeding in this class. A minimum of 3 hours of outside class work is required for every 1 hour of in-class work for most 3-unit upper-division engineering courses. A minimum of 9 hours should be scheduled outside of class every week for this course. Combined with the hours spent in class, a total of 12 hours per week should be dedicated to senior design to make it possible to earn a B or better grade. If a student is taking 12 units of engineering classes, a total of 48 hours per week should be set aside to do well in all classes. If one does not have these many hours because of work or other obligations, then one’s level of understanding and grades will likely suffer.

Open and constructive group communication is essential to succeed in this course. Everyone must be focused on supporting one another and the sponsor/customer. Decisions must be made to move forward. Each team will be faced with having to make decisions for which there are no “right” answers. Be diligent in understanding the problems that are identified and decisions that need to be made, but do not let issues sit unresolved, do not make decisions knowing little about what the expected outcome will be, and do not sit idle, watching the rest of the team work for fear of failure. Everyone has a contribution. This is not a spectator’s profession. This is engineering and manufacturing, which require doing. Doing requires failure, so fail early and often on the path toward success.

Seek out the help that is needed. Talk to instructors and peers. Talk to parents or friends, aunts and uncles. Chat online with an expert. Submit a question on a forum or discussion page. Ask ChatGPT. Do anything proactive to answer the most pressing questions that you have. Embrace this time of open-endedness and forge ahead.
Classroom Protocol

Respect

Arrive on time, which is a few minutes before the scheduled class time. Stay the entire class period. Do not be disruptive and distracting. Students in this class are encouraged to speak up and participate during class meetings. Because the class will represent a diversity of individual beliefs, backgrounds, and experiences, every member of this class must show respect for every other member of this class. (Reference: [http://www.csuchico.edu/diversity/](http://www.csuchico.edu/diversity/))

Safe Zone Statement

I am part of the Safe Zone Ally community network of trained Chico State faculty/staff/students who are available to listen and support you in a safe and confidential manner. As a Safe Zone Ally, I can help you connect with resources on campus to address problems you may face that interfere with your academic and social success on campus as it relates to issues surrounding sexual orientation/gender identity. My goal is to help you be successful and to maintain a safe and equitable campus.

LGBTQ Equality Statement

I am firmly committed to diversity and equality in all areas of campus life, including specifically members of the LGBTQ community. In this class I will work to promote an anti-discriminatory environment where everyone feels safe and welcome. I recognize that discrimination can be direct or indirect and take place at both institutional and personal levels. I believe that such discrimination is unacceptable and I am committed to providing equality of opportunity for all by eliminating any and all discrimination, harassment, bullying, or victimization. The success of this policy relies on the support and understanding of everyone in this class. We all have a responsibility not to be offensive to each other, or to participate in, or condone harassment or discrimination of any kind.

Required Materials

Course Usage of Blackboard Learn
Copies of the course syllabus and major assignments are found on Blackboard Learn. You are responsible for regularly checking the online resources, which is accessed through the [Chico State Portal](http://www.csuchico.edu/diversity/).

Blackboard will be used to send announcements and emails to the entire class on occasion. Students are responsible for knowing and checking regularly the email account associated with their Chico State portal.

Grading Policy

Attendance and In-Class Activities
Attendance in class is extremely important to learning. Attendance will be monitored through various means including Polleverywhere.com, in-class
attendance, in-class discussions once I get to know individuals and teams, among other methods. **No make-up is available for missed in-class activities.**

**Assignment Policy**
Assignment due dates are communicated in class, on Blackboard, and/or in email. Due dates may change from time to time but will never be early than a previously communicated date and time.

No matter the situation, if an assignment is turned in after the day and time that it was due, it will receive a zero grade. See Late Assignment Policy at the end of this syllabus.

**Chico State’s Definition of Grading Symbols**
A - Superior work; a level of achievement so outstanding that it is normally attained by relatively few students.
B - Very good work; a high level of achievement clearly better than adequate competence in the subject matter/skill, but not as good as the unusual, superior achievement of students earning an A.
C - Adequate work; a level of achievement indicating adequate competence in the subject matter/skill. This level or higher will usually be met by a majority of students in the class.
D - Minimally acceptable work; a level of achievement which meets the minimum requirements of the course.
F - Unacceptable work; a level of achievement that fails to meet the minimum requirements of the course. Not passing.

<table>
<thead>
<tr>
<th>Grading Topic</th>
<th>%</th>
<th>T/I</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Proposal Presentation</td>
<td>10</td>
<td>I</td>
<td>Demonstrate that the design problem is understood, well defined, and justified.</td>
</tr>
<tr>
<td>Preliminary Design Review Presentation</td>
<td>15</td>
<td>I</td>
<td>Demonstrate that a valid concept has been developed. Convince your customer to proceed with detailed design.</td>
</tr>
<tr>
<td>Final Design Review Presentation</td>
<td>20</td>
<td>I</td>
<td>Demonstrate that the solution will meet the requirements and solve the problem. Convince your customer to proceed with prototype construction.</td>
</tr>
<tr>
<td>Draft Design Report</td>
<td>5</td>
<td>T</td>
<td>Graded only for completeness.</td>
</tr>
<tr>
<td>Final Design Report</td>
<td>25</td>
<td>T</td>
<td>Content, organization, style, format.</td>
</tr>
<tr>
<td>Contribution to Project</td>
<td>25</td>
<td>I</td>
<td>Peer review and evaluation by faculty advisor.</td>
</tr>
</tbody>
</table>

Note: If warranted, the course instructor, with input from the faculty advisor, may issue a failing grade regardless of a student’s computed final average.
Grade Disputes
Final grades are non-negotiable. If you think a grading error has been made for any graded assignment throughout the term, you must bring this to my attention within two weeks of the date the grade was posted. Grade disputes brought up after final grades are posted will not be considered.

Cheating
Engineering is an honorable profession. Cheating is not honorable. Anyone caught cheating on any assignment will receive an automatic F for the course, a report will be submitted to Student Judicial Affairs, and retaking the course for forgiveness may not be possible.

University Policies and Campus Resources

Dropping and Adding
You are responsible for understanding the Academic Policies and Regulations within the Academic Standards and Policies section of the University Catalog. You should be aware of the deadlines and penalties for adding and dropping classes.

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 on the Student Conduct, Rights, and Responsibilities web site.

ECC Student Support Services
Academic advising, Career advising, tutoring, time management, and more is available through the College of Engineering, Computer Science, and Construction Management (ECC) Student Success Center in OCNL 246.

IT Support Services
Computer labs for student use are located on the fourth floor of the Meriam Library Room 450. Remote access to most of the programs found in on-campus labs is available through Wildcat Lab. You can get help using your computer from IT Support Services. Additional labs may be available to students in your department or college.

Student Services
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 through Student Resources and Services.

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

**Student Learning Center**
The mission of the Student Learning Center (SLC) is to provide services that will assist Chico State 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.
Late Assignment Policy

This policy applies to all assignments. Assignments include but are not limited to submitted artifacts, e.g. homework, reports, exams, attendance in class or outside of class, and any other evaluated work that is the bases for the course grade.

This agreement is non-negotiable and must be completed by anyone requesting credit for a late assignment. An assignment is late if it is turned in after the day and time that it was due. There are no exceptions.

If you rescheduled an exam or assignment, it is not late. Do not submit this document. Rescheduling an exam or assignment must be done at least 48 hours in advance of the due date and must include my confirmation in writing (email is acceptable). Rescheduling an exam or homework will be granted only for events outside of the student’s control and will require the assignment or exam to be submitted or taken earlier than the scheduled time.

If this agreement and supporting documentation does not accompany the late assignment, no credit will be given for the assignment, and I will not discuss the particular situation that resulted in the late assignment.

No credit will be given if the answer to the question below is No. Do not submit the assignment for credit and do not discuss the situation with me even though it may be unique or special.

If the answer to the question below is Yes, the assignment will be considered for credit.

Circle your answer to the below question.

Were you involved in an accident, admitted to the hospital, seen by a medical professional, presenting flu or flu-like symptoms on or within 24 hours of the assignment or exam due date or did an unexpected or unplanned interview or phone call for a job or potential job offer occur at the time of the assignment or exam due date?

Yes  No

Provide documented evidence (admission to a medical facility for care but do not ask the student health center for a note, job offer, email of time conflict from potential job offer, or other documented evidence of the accident or event) that includes the date and time of service or event and submit with this signed agreement to me with the late assignment.

For what assignment are you seeking credit? __________________________________________________

When was the assignment due? _______________________________________________________________

What date was the assignment submitted? _____________________________________________________

Explain briefly the reason that assignment is late:

_____________________________________________________________________________________

_____________________________________________________________________________________

Name: ____________________________________________________________

Signature: __________________________ Date: __________________________