California State University, Chico
Mechanical and Mechatronic Engineering and Advanced Manufacturing
MECH 340W: Mechanical Engineering Design
Fall Semester, 2023

Instructor: Dr. Dennis O'Connor

Office Hours: O'Connell 417; Tuesday and Thursday, 10AM - Noon

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Prerequisites: MECH 100, 100L; MECH 210 and CIVL 311 with C- or higher. Students who have not met the prerequisites will be dis-enrolled from the course unless given permission through the department.

Textbooks: *Shigley's Mechanical Engineering Design* (11th Edition) by Budynas and Nisbett, McGraw-Hill 2015.

Class: *Lecture* – O'Connell 254; MWF, Noon - 12:50PM
          Activity – O' Connell 431; Section-02 Monday, Section-03 Wednesday, 2 - 3:50PM

Course Grade: Minimum passing grade is C-, letter grades will be assigned as follows.

- ❖ Homework 10%
- ❖ Technical Writing and Design Activities 40%
- ❖ Exams 50%

[90,100]	A
[80,90)	B
[70,80)	C
[60,70)	D

Homework: Weekly textbook problem sets and homemade exercises will be posted on the Canvas class site or given as handouts during class and due by start of class on assigned due date. Late submission, illegible handwriting, or unorganized homework will be subject to lost points.

Technical Writing and Design Activities: A sequence of technical writing and paper design activities will be facilitated through the two hour activity time. The paper design activities will give you an opportunity to practice and learn the course material in a manner which requires technical communication, both written and graphical. Early assignments will focus on gaining technical writing skills such as format, display of engineering analysis, equations, figures, and tables. Later assignments will involve considerably more engineering analysis and design work, including: utilizing engineering codes and standards, part and assembly drawings with GD&T, and manufacturing of design. The final design activity will be a group project. Note, plagiarism and use of AI tools are strictly prohibited and may result in a zero or failing grade.

Exams: There will be two normal class exams (each 15% of grade) and a two-hour final exam (20% of grade) for the semester. Each answered question must show relevant equations and sufficient work necessary to calculate the answer. The final answer must have correct units to avoid further lost points.

Course Schedule: The following table is a tentative course schedule outlining the chapters covered and approximate time for the Tests.

Week	Dates	Topics	Readings
1	Aug 21 - Aug 25	Load and Stress Analysis, Ch.3	3.1 – 3.6
2	Aug 28 - Sept 1	Load and Stress Analysis, Ch.3	3.7 – 3.12
3	Sept 4 - Sept 8	Load and Stress Analysis, Ch.3	3.13 – 3.19
4	Sept 11 - Sept 15	Deflection and Stiffness, Ch.4	4.1 – 4.17
5	Sept 18 - Sept 22	Static Load Failure Theories, Ch.5	5.1 – 5.13
6	Sept 25 - Sept 29	Review (Exam I: 3,4,5)	
7	Oct 2 - Oct 6	Dynamic Load Fatigue Failure, Ch.6	6.1 – 6.10
8	Oct 9 - Oct 13	Dynamic Load Fatigue Failure, Ch.6	6.11 – 6.17
9	Oct 16 - Oct 20	Shaft Components, Ch.7	7.1 – 7.4
10	Oct 23 - Oct 27	Shaft Components, Ch.7	7.5 – 7.8
11	Oct 30 - Nov 3	Review (Exam II: 6,7)	
12	Nov 6 - Nov 10	Gears-General, Ch.13	13.1 – 13.9
13	Nov 13 - Nov 17	Gears-General, Ch.13	13.10 – 13.17
14	Nov 20 - Nov 24	Fall	Break
15	Nov 27 - Dec 1	Rolling-Contact Bearings, Ch.11	11.1 – 11.12
16	Dec 4 - Dec 8	Design Project and Review	
17	Dec 11 - Dec 15	Final Exam	Comprehensive

Academic Integrity: Plagiarism and copied work or use of AI, with or without alterations, on exams or individual activity assignments may result in an automatic F in this class for all parties involved. Students are encouraged to help each other, but should never share files. Such incidences will be documented by Student Judicial Affairs and subject to appropriate consequences. Students are expected to be familiar with the University's Academic Integrity Policy. The policy on academic integrity and other resources related to student conduct can be found at: https://www.csuchico.edu/scrr/integrity.shtml

Student Learning Center: 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 SLC is online at http://www.csuchico.edu/slc.

MECH 340W Course Objectives: For students to:

1) Learn a process for designing mechanical systems with a balance of the conceptualization and detail design phases of the process.

2) Synthesize and apply concepts from the engineering sciences including statics, dynamics, strength of materials, and materials science.

3) Practice choosing parameters for a mechanical system (e.g., dimensions and material properties) based upon a set of performance specifications.

4) Learn how to determine allowable stresses in a component based upon an appropriate theory of failure and a reasonable set of assumptions including factors of safety where appropriate.

5) Learn how to mathematically model a selection of common mechanical components in order to predict particular performance measures and to utilize equation solving software to streamline the analytical solution process.

6) Have opportunities to be creative, and at the same time, mindful of the constraints imposed by material limitations, manufacturing, standard practices, codes and standards.

7) Be introduced to the concepts of uncertainty and reliability in design, as they pertain to material properties, manufacturing processes, and applied loads.

8) Learn how to follow industry standards on technical writing and graphical communication of mechanical design.

MECH 340W Course Outcomes: Students shall be able to:

1) Apply energy methods to relate the steady-state input/output characteristics of machines to relate quantities such as torque, force, velocity, and angular velocity.

2) Determine stresses in straight, slender bodies caused by combinations of axial, shear, bending, and torsional loads.

3) Determine stresses in curved beams.

4) Determine miscellaneous stresses in machine components such as direct shear, tearout, and bearing stresses that occur commonly with interconnected machine parts.

5) Apply stress concentration factors where appropriate.

6) Determine principal stresses due to combinations of simple stress states.

7) Size components using static failure theory.

8) Size components using fatigue failure theory.

9) Estimate and apply appropriate factors of safety for a given machine environment and loading, and apply them in selecting materials and sizing selected machine components.

10) Determine the appropriate size of a rotating shaft for infinite-life strength.

11) Select components such as bearings, gears, springs, threaded fasteners, clutches and brakes based on accepted practice and theory for particular machine elements.

12) Follow industry specific guidelines to produce a technical design report.

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) and Student Services Center (arcdept@csuchico.edu).