Instructor: Dr. Dennis O'Connor

Office Hours: O'Connell 417, Tuesdays and Thursdays (10:00 - 11:50AM)

Contact: 530-898-4829, dmoconnor@csuchico.edu

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.


Class: O’Connell 254, lectures MWF 11:00 - 11:50AM and activities on Mondays 2:00-3:50PM

Course Grade: Letter grades will be assigned according to the following list and table.

- Homework 10%
- Design Activities 20%
- Design Project 20%
- Exams 50%

<table>
<thead>
<tr>
<th>Grade Range</th>
<th>Letter Grade</th>
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</thead>
<tbody>
<tr>
<td>[90,100]</td>
<td>A</td>
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<tr>
<td>(80,90)</td>
<td>B</td>
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<tr>
<td>[70,80)</td>
<td>C</td>
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<tr>
<td>(60,70)</td>
<td>D</td>
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Homework: Problem sets will be posted on the Blackboard class site and will be collected at the START of the class period on the due date specified. Late homework, including after the start of class, will not be graded. Work must be legible for full credit and the final answer of each problem enclosed in a box.

Design Activities: A combination of short paper design assignments and hands-on experiments will be facilitated through Monday’s two hour activity time. Experiments will focus on utilizing professional strain gauge measurements to demonstrate key stress-strain relationships for machine design. The paper design activities will give you an opportunity to practice the course material in a manner which requires technical communication, both written and graphical.

Design Project: The design project in MECH 340 will be a group assignment requiring the practice of design, fabrication and presentation. This semester’s project will be on making a coffee grinder machine with emphasis given to the technical design report and implementation of course-related material. Each group will be provided a set of conical burrs and access to electrical motors through the Mechatronics Center. The following list describes the general project makeup.

- Design Report 10%
- Poster 5%
- Prototype coffee grinder 5%

Exams: There will be three one-hour exams throughout the semester plus a two-hour final exam. The one-hour exams each be worth 10% of your grade and the final 20%. Exams will be open-book and open-note, paper only. For full credit, each answered question must demonstrate sufficient work and maintain correct units.
Assessment: As per ABET (Accreditation Board for Engineering and Technology, Inc.) guidelines, MECH 340 is used to assess certain abilities required of an engineering student. To this end, particular assignments and exams will be considered as a measure of your abilities. Failure to achieve the minimum standards set-out by ABET will result in an automatic F in this class. The following lists describe the required abilities assessed in this course.

For Mechanical Engineering Students:

a) An ability to apply knowledge of mathematics, science, and engineering.

   c1) An ability to design a mechanical system, component, or process to meet desired needs.

   g2) An ability to communicate technical matters effectively in written form.

   g3) An ability to communicate technical matters effectively in graphical form.

For Mechatronic Engineering Students:

a) An ability to apply knowledge of mathematics, science, and engineering.

   g2) An ability to communicate technical matters effectively in written form.

   g3) An ability to communicate technical matters effectively in graphical form.

*For both mechanical and mechatronic engineering students, the exams in MECH 340 will be used to assess your ability to “… apply knowledge of mathematics, science, and engineering.” An average grade of C or better is required on the exams to obtain a passing grade in this course. Failure to achieve at least a C average grade on the exams will result in an automatic F in the course.

*The design project and select individual design activities will be used to access your abilities in the remaining areas. For mechanical engineering students, that includes areas c1), g2) and g3). For mechatronic engineering students, that includes areas g2) and g3). To obtain a passing grade (C or higher) in the course, each student must satisfy the following minimum criteria:

1. An average grade of C on the design project and select design activities.
2. A grade of C on the written summary of the design project and select design activities.
3. A grade of C on the graphical presentation of the design project and select design activities.

Collectively these demonstrate minimal competency in mechanical design.

Design Drawings: Design drawings are expected to conform to the MMEM Department drawing standards. Further information can be found on at: [http://www.csuchico.edu/mmem/drawing_standards.shtml](http://www.csuchico.edu/mmem/drawing_standards.shtml) and the specific standards at: [http://www.csuchico.edu/mmem/documents/Department_Drawing_Standard.pdf](http://www.csuchico.edu/mmem/documents/Department_Drawing_Standard.pdf).

*Templates for SolidWorks drawings which conform to the Department Standards for Working Drawings are available on the College of Engineering, Computer Science, and Construction Management computer network in the folder Y:\_MMEM Dept Drawing Standards. The available files are

- MMEM Standard Drawing Template - Size A.slddrt
- MMEM Standard Drawing Template - Size B.slddrt
- MMEM Bill Of Materials Template.sldbomtbt
- MMEM Revision Table Template.sldrevtbt

Academic Integrity: Incidences of plagiarism will be referred to student judicial affairs and may result in failure in the course. 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: [http://www.csuchico.edu/sjd/integrity.shtml](http://www.csuchico.edu/sjd/integrity.shtml).
**Course Schedule:** The following table is a tentative course schedule outlining the chapters covered and approximate time for the Tests.

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<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topics</th>
<th>Readings</th>
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<tbody>
<tr>
<td>1</td>
<td>Aug 27 – Aug 31</td>
<td>Load and Stress Analysis, Ch.3</td>
<td>3.1 – 3.6</td>
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<tr>
<td>2</td>
<td>Sept 3 – Sept 7</td>
<td>…</td>
<td>3.7 – 3.12</td>
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<tr>
<td>3</td>
<td>Sept 10 – Sept 14</td>
<td>…</td>
<td>3.13 – 3.19</td>
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<tr>
<td>4</td>
<td>Sept 17 – Sept 21</td>
<td>Deflection and Stiffness, Ch.4</td>
<td>4.1 – 4.17</td>
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<td>5</td>
<td>Sept 24 – Sept 28</td>
<td>Exam 1</td>
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<tr>
<td>6</td>
<td>Oct 1 – Oct 5</td>
<td>Static Load Failure Theories, Ch.5</td>
<td>5.1 – 5.13</td>
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<tr>
<td>7</td>
<td>Oct 8 – Oct 12</td>
<td>Dynamic Load Fatigue Failure, Ch.6</td>
<td>6.1 – 6.17</td>
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<tr>
<td>8</td>
<td>Oct 15 – Oct 19</td>
<td>Shaft Components, Ch.7</td>
<td>7.1 – 7.8</td>
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<td>9</td>
<td>Oct 22 – Oct 26</td>
<td>Exam 2</td>
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<td>10</td>
<td>Nov 5 – Nov 9</td>
<td>Nonpermanent Joints, Ch.8</td>
<td>8.1 – 8.12</td>
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<td>11</td>
<td>Nov 12 – Nov 16</td>
<td>Gears-General, Ch.13</td>
<td>13.1 – 13.17</td>
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<td>12</td>
<td>Nov 19 – Nov 23</td>
<td>Thanksgiving Break</td>
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<tr>
<td>13</td>
<td>Nov 26 – Nov 30</td>
<td>Rolling-Contact Bearings, Ch.11</td>
<td>11.1 – 11.12</td>
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<td>14</td>
<td>Dec 3 – Dec 7</td>
<td>Brakes, Couplings, Flywheels, Ch. 16</td>
<td>16.1 – 16.12</td>
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<tr>
<td>15</td>
<td>Dec 10 – Dec 14</td>
<td>Design Review</td>
<td></td>
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<tr>
<td>16</td>
<td>Dec 17 – Dec 21</td>
<td>Final Exam</td>
<td></td>
</tr>
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**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).

**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 340 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.

MECH 340 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.