MEMS 1028

Mechanical Design I *(Fall 2019)*

Instructor Dr. Sam Ghalambor
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Office Hours – Monday 12:00(PM)-1:30(PM) , or by appointment

Course Description and Objective

This course provides an overview of strength of materials analysis techniques as related to the design of mechanical components. The basic topics of uniaxial tension/compression, torsion, bending and combined loading will be reviewed in the context of failure analysis. Failure theories and criterion for both static and fatigue conditions will be presented and applied to mechanical design.

Course Prerequisites

Statics and Mechanics of Materials 1 & 2 or equivalent.

Course Textbook & Reference Materials

Course	*Shigley's Mechanical Engineering Design*, Budynas and Nesbett, 10th Ed., McGraw-Hill
Reference	*Statics and Mechanics of Materials: An Integrated Approach*, Riley, Sturges, 2nd Ed.,
Reference	Mechanics of Materials, *Ferdinand P. BeerE. Russell Johnston, Jr. John T. DeWolf*, 6th Ed.
Reference	*Flexures – Elements of Elastic Mechanisms*, S. T. Smith, CRC Press
Reference	*Stress Concentration Factors*, Peterson
Reference	*Criteria for the Design of Pressure Vessels*, ASME

Course Topics

- Review of Statics and Strength of Materials
- Mechanical Design Elements (Spring, Bars, Beam, Pressure Vessels)
- Modes of Mechanical Failure (Failure Criteria)
- Advanced Stress and Deformation Analysis (Combined Loading, Mohr's Circle, Buckling)
- Stiffness Driven Design (Flexural Elements, Mechanical Hinges)
- Stress Concentrations (Static, Fatigue)
- Design Standards - (Application of ASME Pressure Vessel Code)
- Static Failure Theories (Brittle Materials, Ductile Yielding, Ultimate Strength)
- Fatigue Failure Theories (Service Life Estimates, Soderberg and Modified Goodman Methods)

Participation

Class participation is strongly encouraged. Your contributions and insights will be a valuable component of our lecture discussions and will improve the active learning process.

Assigned Problem Sets and Quizzes

Each week a problem set reflecting relevant course content will be posted. The solutions will be posted at the same time. Periodically a quiz will be given based on the most recent problem set. All quizzes will be given during the last 20 minutes of a lecture period and will be announced one week in advance. Make-up quizzes will not be offered under any circumstances. The lowest quiz score will be dropped to offset a missed quiz. All work presented on quizzes must adhere to the "Guidelines for the Preparation of Homework and Exam Solutions." Quizzes are weighted as 10% of your final grade.

Grading Policy

The course grade will be determined based on the following contributions:

Participation	10%	Midterm I	20%
Homework	10%	Midterm II	20%
Quizes	10%	Final Exam	30%

Midterm Exam Dates

Midterm I	Around Mid October
Midterm II	Around late November

Quizzes and Exams

- An official equation sheet will be provided for each quiz and exam.
- All quizzes and exams will be closed book and notes. The final exam will be cumulative.
- All work presented must adhere to the "Guidelines for the Preparation of Homework and Exam Solutions."
- Calculators are permitted during exams. You may not access the Internet during an exam for any reason.

Grade Dispute Process

If an oblivious error in grading has been made I will correct it immediately. All disputes regarding severity and judgment must be filed through a written process. All appeals are to be made by submitting a package including the following information:

- A complete copy of your entire quiz or exam.
- A cover page describing which problems are in question and the details of the disputed mark.
- A complete rework of a disputed problem on a separate sheet of paper.

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact me or admin Staff for accommodation.

Academic Integrity

All students are expected to adhere to the standards of academic honesty. Any student engaged in cheating, plagiarism, or other acts of academic dishonesty would be subject to disciplinary action. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity . This may include, but is not limited to the confiscation of the examination of any individual suspected of violating the University Policy.

Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.