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## **MEMS 1028 – MECHANICAL DESIGN I**

### **2022-2023 Fall**

*(Modifications to this syllabus may be required during the semester. Any changes to the syllabus will be posted on the course website and announced in class)*

### **Catalog Description**

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 (3 credit hours).

### **Prerequisites:**

- ENGR0145 Statics & Mechanics of Materials II or equivalent

**Schedule:** Lecture, Room A607 Teaching Building 1, Wednesday 08:15 – 11:00

**Instructor:** S.C. Fok, Office: Room 222 (Zone 4)

**Office Hours:** Monday & Tuesday 1:00pm – 5:00pm,

For consultation outside office hours, please send an email to make an appointment

Email: saicheong.fok@scupi.cn

**Teaching Assistant:** Oliver Xie (contact: [xiexing@stu.scu.edu.cn](mailto:xiexing@stu.scu.edu.cn), phone: 17382214007)

### **Textbook**

Shigley's Mechanical Engineering Design, 11ed, Budynas & Nesbett, McGraw Hill, ISBN 9780073398211

Additional references and supplementary materials will be posted on Blackboard.

### **Learning Outcomes**

After the successful completion of this course students should be able to:

- Analyze the design of mechanical components,
- Apply failure theories and criteria for both static and fatigue conditions to mechanical design,
- Acquaint with established standards and codes in engineering design,
- Explain the design considerations, design uncertainties and the responsibilities of the designer.

**Grading Policy**

Grade will be based on overall performance in all assessment items as follows (note: the assessment items and percentages may be subjected to change):

| ACTIVITIES              | PERCENTAGES |
|-------------------------|-------------|
| Quizzes and assignments | 15%         |
| Projects                | 15%         |
| Midterms                | 40%         |
| Final                   | 30%         |

Submission requirements (including due dates) for all assessments will be announced to students in class or on Blackboard. Letter grades are based on SCUPI standard policy

**Tentative Course Schedule (changes will be announced):**

| Week | Text              | Topic  |
|------|-------------------|--|
| 2    | Chap. 1           | Introduction and review of basic concepts in Statics     |
| 3    | Chap. 3           | Mechanical Design Elements (Revision)                    |
| 4    | Chap. 3           | Mechanical Design Elements (Beams)                       |
| 5    | Chap. 3           | Advanced Stress Analysis (Shafts)                        |
| 6    |                   | Public holidays  |
| 7    | Chap. 3           | Advanced Stress Analysis (Pressurized cylinders, etc.)   |
| 8    |                   | Midterm  |
| 9    | Chap. 4           | Advanced Deformation Analysis (Stiffness driven designs) |
| 10   | Chap. 4           | Advanced Deformation Analysis (Castigliano's theorem)    |
| 11   | Chap. 4           | Advanced Deformation Analysis (Columns)                  |
| 12   |                   | Midterm  |
| 13   | Chap. 5           | Static Failure Theories                                  |
| 14   | Chap. 5 & Chap. 6 | Fracture mechanics and Fatigue Failure                   |
| 15   | Chap. 6           | Fatigue Failure (Reversible load)                        |
| 16   | Chap. 6           | Fatigue Failure (Fluctuating simple load)                |
| 17   | Chap. 6           | Fatigue Failure (Combined stresses)                      |
|      |                   |  |

The course will cover the analysis and design of simple mechanical components through guided learning, discussions, formative exercises, quizzes, and project(s). In class design exercises involve student participation. Projects will enable students to apply the knowledge in the analysis and design of mechanical devices. Quizzes, and home-works will focus on fundamentals so that students can better understand basic concepts. Formative exercises would help students to better understand the learned concepts.

**Class Policies:**

- Regular class attendance is expected.
- Assessments will evaluate the student's understanding of material covered in lectures and reading assignments. The submission requirements are clearly stated in the assessment items. No marks will be awarded for failure to meet the submission requirements.
- Late submissions will not be accepted unless you have made prior arrangements with Instructors. However, if a student has a valid reason and cannot submit an assessment item by the deadline, the student must contact the instructor immediately. Failure to do so will result in a zero for that assessment item. If the reason stated is consistent with University Policy, arrangements can be made for the student to resubmit the assessment item (or for alternate assessment).
- Once the graded assessment item has been returned to the student (or solution to the assessment item has been released, no makeup of the assessment will be allowed even if there is a valid reason.
- Challenge to the grading must be made within 7 days after the returned of the assessment item or after the release of the solutions. No challenges to the grading will be entertained after the 7-day period.
- Academic misconduct will not be tolerated. All misconduct will be reported and dealt with by SCUPI.

Honesty Policy: All students admitted to the SCUPI have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a SCUPI student.

**ACADEMIC INTEGRITY**

Students in this course will be expected to comply with the Sichuan University's Policy on Academic Integrity. 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 University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.