

**MEMS 1028 – MECHANICAL DESIGN I****2023-2024 Spring**

*(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 elements. 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 New teaching building room 209, Tuesday 08:15 – 11:00

**Instructor**

S.C. Fok (Email: [saicheong.fok@scupi.cn](mailto:saicheong.fok@scupi.cn))

Office: Room 222 (Zone 4); or Room 505 (SCUPI new building).

**Office Hours**

Monday 12:00 – 13:00 Tuesday 12:00 – 17:00

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

**Teaching Assistant**

Ms. Nancy Li (Email: [2020141520081@stu.scu.edu.cn](mailto:2020141520081@stu.scu.edu.cn); Mobile: 17685592912)

**Textbook**

- Shigley's Mechanical Engineering Design, 11ed, Budynas & Nesbett, McGraw Hill, ISBN 9780073398211
- Additional references and supplementary materials will be posted on Blackboard.

**Course Objectives**

The course objectives are:

- Introduce students to the design of mechanical elements based on strength of materials analysis.
- Acquaint students with the application of standards and codes in engineering design.

**Learning Outcomes**

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

- Analyze mechanical designs based on stress and strain.
- Apply static failure theories in the design of mechanical element.
- Apply fatigue failure theories in the design of mechanical elements.
- Apply established standards and codes in engineering design.
- Consider uncertainties along with other social and economic factors in engineering design.

**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	10%
Projects	20%
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
1	Chap. 1	Introduction and review of basic concepts in Statics
2	Chap. 3	Revision
3	Chap. 3	Revision
4	Chap. 3	Mechanical Design Elements (Beams)
5	Chap. 3	Advanced Stress Analysis (Shafts)
6	Chap. 3	Advanced Stress Analysis (Pressure vessels)
7		Midterm
8	Chap. 4	Advanced Deformation Analysis (Stiffness driven designs)
9	Chap. 4	Advanced Deformation Analysis (Castigliano's theorem)
10	Chap. 4	Advanced Deformation Analysis (Columns)
11		Midterm
12	Chap. 5	Static Failure Theories
13	Chap. 5 & Chap. 6	Fracture mechanics and Fatigue Failure
14	Chap. 6	Fatigue Failure (Reversible load)
15	Chap. 6	Fatigue Failure (Fluctuating simple load)
16	Chap. 6	Fatigue Failure (Combination of loading modes)
17		Revision or Final exam

The course will cover the analysis and design of simple mechanical components through guided learning, discussions, formative exercises, quizzes, and project(s). In class assignments involve student participation. Projects will enable students to apply the knowledge in the analysis and design of mechanical devices. Quizzes, and assignments 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**

- Sichuan University attendance policy will be enforced. Attendance will be taken at the start and at the end of the class. Students who come to class more than 15 minutes late (without valid reasons) will be considered as absence. Students who leave class early (without valid reasons) will be considered as absence. Students who sign the attendance for another student will be considered as absence and will be reported to the University as a misconduct. Students performing activities not associated with the course while in class (e.g. sleeping, watching video, playing games, doing other course assignments or personal work) will be considered as absence.
- Students with 3 unexcused absences (including lateness or leaving class early) will receive zero for all assessment items except examinations. These assessment items include assignments, quizzes, laboratory exercises, projects, etc.
- All assessment items have clearly stated submission requirements. No marks will be given if the submission requirements are not met. Late submissions will not be accepted. No makeup assignments, quizzes, laboratory exercises, and projects will be allowed.
- If a student cannot attend the midterm examinations, the student must contact the instructor immediately with a valid reason. If the reason stated is consistent with University Policy, arrangements can be made for alternate assessments. Otherwise, the student will get zero for the midterm examinations.
- If a student has a valid reason and cannot attend the final exam, the student must apply to the administration for a defer examination.
- 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 and non-academic misconduct will not be tolerated. All misconduct will be reported and dealt with by SCUPI.

### **ACADEMIC MISCONDUCT**

All students in attendance at the Sichuan University are expected to be honorable and to observe standards of conduct appropriate to a community of scholars. The University expects from its students a higher standard of conduct than the minimum required to avoid discipline. Academic misconduct includes all acts of dishonesty in any academically related matter and any knowing or intentional help or attempt to help, or conspiracy to help, another student. The Academic Misconduct Disciplinary Policy will be followed in the event of academic misconduct.

**NON-ACADEMIC MISCONDUCT**

All cell phones, computers and mobile phones are to be turned off and put out of sight during lectures (mobile phones and computers can be turned on during online quizzes). All newspapers and other materials not related to the class are to be put away once class begins. Operating these devices and reading unrelated materials while in class is disrespectful of your instructor and fellow classmates. If you fail to abide by this rule, the instructor has the right to confiscate the device or materials and mark you as absence. If you have an emergency and need to have your phone turned on during class, ask your instructor for permission.