

MEMS 1028 MECHANICAL DESIGN I

FALL, 2026

INSTRUCTOR:	Dr. Ruiqi DONG
OFFICE:	N522
EMAIL:	ruiqi.dong@scupi.cn
OFFICE HOURS:	Monday 14:00~18:00 PM & Friday 9:00~12:00 AM Any other days - by appointment only at N522
LECTURES:	Tuesday 8:15-11:00 AM, S104
TEXTBOOK:	Shigley's Mechanical Engineering Design. 11th edition by <i>Keith J. Nisbett, Richard G. Budynas</i> , McGraw-Hill, 2021.
TEACHING ASSISTANT:	Li Xiang, 2023 MSE Tel: 13684251323, E-mail: 2023141520094@stu.scu.edu
PREREQUISITE:	MATH 0240 Analytic Geometry & Calculus 3 ENGR 0135 Statics & Mechanics of Materials I ENGR0145 Statics & Mechanics of Materials II

DESCRIPTION: This course provides an overview of strength of materials analysis techniques as related to the design of mechanical elements. The basic topics of uni-axial 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).

COURSE OBJECTIVES: This course will 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 using appropriate learning strategies; develop the students' skills in the communication of design analysis and synthesis. After the successful completion of this course students should be able to:

- ✓ analyze and report mechanical designs based on stress and strain
- ✓ apply static failure theories in the design of mechanical elements
- ✓ apply fatigue failure theories in the design of mechanical elements

LEARNING OUTCOMES FOR THIS COURSE:

- ✓ apply established standards and codes in engineering design
 - ✓ consider uncertainties along with other social and economic factors in engineering design
- (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
 - (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
 - (3) an ability to communicate effectively with a range of audiences.
 - (4) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

GRADE DETERMINATION:

While grades may be curved, there is no guarantee of any curve. If any student fails this course and takes Make-Up exam, the highest grade that student can receive is D.

Quizzes and assignments	10%
Projects	30%
Mid-term exam	30%
Final exam	30%

EXAMS:

- (1) There will be one mid-term exam and one final exam. The exams in this course will be **closed book and closed note**. Exam related forms, appendices, standards and codes will be provided with the test paper, but they will not be announced before the exam.
- (2) If you are absent from any exam without a valid reason and prior report, there will be **no make-up exam**.
- (3) For **mid-term exam**, if you have a serious conflict with the exam time, you must discuss it with the instructor well ahead of the scheduled exam day (**at least one day in advance**) to make an appropriate arrangement.
- (4) For **final exam**, if you have a valid reason for not being able to attend the final exam, you must **submit a formal application for a deferred exam** to the administration.
- (5) Exams missed due to unpredictable events such as a family emergency and a traffic accident will be handled according to **SCU and institutional policies**, if the student has a proper document(s) to prove it.

QUIZZES:

In-Class Quiz will be given weekly during class hours, and there is **no make-up** for quiz if you are absent from the class. You will work on and complete these problems as an individual within given time. All the In-Class Quiz and projects should be **submitted on BB**, and the answers **must be handwritten** otherwise no credit will be given for that work.

PROJECTS:

There will be two projects, and the submission requirements (including due dates) will be announced in class or on BB. You should complete the entire project **independently** to reinforce and extend the knowledge of the material learned in class. Students are also encouraged to work with your classmates to inspire thinking and improve communication skills. Should you have any trouble with the homework, ask TA and instructors for help during designated office hours.

GRADE REBUTTAL:

- (1) For projects and quizzes, challenge to the grading must be made **within 3 days** after the returned of the graded assessment item. **No challenges** to the grading will be entertained **after the final exam**.
- (2) For exams, graded papers and standard answers will not be handed out. If you have enough confidence to argue about your score, please check your test paper at the time and place designated by the instructor or TA, and there is **no guarantee that the score will change** in any way.

MAKE-UP POLICY:

If you fail this course, the eligibility and grading criteria for the make-up exam at the beginning of the next semester will be implemented in accordance with university policies. The scope and requirements of the make-up exam are the same as those of the final exam.

OTHER POLICIES:

ATTENDANCE:

- ✓ Although attendance is not included in the grading, Sichuan University attendance policy will be enforced. Students who missed **more than a third of the classes** (these absences included classes missed with and without approval and valid reasons) will lose the right to be assessed and will receive zero for the course. These students will NOT be allowed to take the makeup exam.

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. Academic misconduct will not be tolerated. All misconduct will be reported and *The Academic Misconduct Disciplinary Policy* will be followed in the event of academic misconduct.

CHANGES:

- ✓ The instructor reserves the right to extend credit for alternative assignments, projects, or presentations and to make changes to this syllabus as needed. All changes will be announced via Blackboard and/or announced in class.

Tentative Course Schedule (changes will be announced):

Week	Chapter	Topic & Description
1	Chap. 1	Introduction and review of basic concepts in Statics
2	Chap. 3	Load and Stress Analysis
3	Chap. 3	Mechanical Design Elements (Beams)
4	Chap. 3	Advanced Stress Analysis (Shafts)
5	Chap. 3	Advanced Stress Analysis (Pressurized cylinders, etc.)
6	Chap. 3	Project 1
7	Chap. 4	Advanced Deformation Analysis (Stiffness driven designs)
8	Chap. 4	Advanced Deformation Analysis (Strain energy and Castigliano's theorem)
9	Chap. 4	Advanced Deformation Analysis (Buckling of Columns)
10	Chap. 3&4	Mid-Term Exam
11	Chap. 5	Static Failure Theories
12	Chap. 5 & 6	Fracture mechanics and Fatigue Failure

13	Chap. 6	Fatigue Failure (Reversible load)
14	Chap. 6	Fatigue Failure (Fluctuating simple load)
15	Chap. 6	Fatigue Failure (Combined stresses)
16	Review	Chap. 3 ~ 6
17	Final Exam	