

ENGR 0145 Statics and Mechanics of Materials II

Instructor: Dr. Ruiqi DONG
E-mail: ruiqi.dong@scupi.cn
Office hours: Monday 13:00~18:00 PM, Tuesday 9:00~12:00 AM
Any other days - by appointment only at N522
Class time: Tuesday 13:50~16:25 PM
Class location: SCUPI New Building N210

Catalog description: The course develops the theory behind the fundamental topics of mechanics of materials and demonstrates how this theory is put into practice to analyze and design structural elements. Techniques are presented to analyze deformation /strains as well as forces/stresses for beams. Buckling and combined loading configurations will be analyzed through stress, strain and deformation. Methods to design simple flexural and buckling members in accordance prescribed limits of stress and deflection will be demonstrated. (3 credit hours)

Course objective The aim of this course is:

- ✓ To introduce shear force & bending moment diagrams, shear force, transverse loading relationship, and flexure formulas
- ✓ To learn the concepts of deflection of beams, differential equation of deflection curve, method of super-position
- ✓ To study the stress and strain states both analytically and graphically (Mohr's Circle) at various orientation angles
- ✓ To analyze the buckling loads of columns with various end conditions
- ✓ To implement and apply these ideas for analysis of structures and design of new structures

Course contributes to the following ABET Criterion 3 outcomes:

- 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.
- 6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Prerequisites: ENGR 0135 Statics and Mechanics of Materials I

Textbook: W. F. Riley, L. D. Sturges, and D. H. Morris: Statics and Mechanics of Materials: An Integrated Approach. 2nd Edition. John Wiley & Sons, Inc.

Reference: R. C. Hibbeler Engineering Mechanics: Statics. 13th Edition. Pearson Prentice-Hall. 2013
J. M. Gere and B. J. Goodno Mechanics of Materials. 8th Edition. Cengage Learning. 2012.

Topics Covered

1. Flexural Loading: Stresses in Beams
2. Flexural Loading: Beam Deflections
3. Plane Stress & Strain
4. Principal Stress & Strain and Maximum Shear Stress and Strain
5. Mohr's Circle for Plane Stress and Strain
6. Generalized Hooke's Law
7. Combined Loads
8. Columns: Buckling

Grades

Homework	10%
In-class quiz	20%
Mid-term exam	30%
Final exam	40%

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.

Homework, Reading Assignment, In-Class Quiz and Exams

There will be homework problems assigned on weekly base, which will be graded as 10% of your grade. I strongly encourage for students to **work on homework on their own** since doing homework independently will reinforce and extend the knowledge of the material learned in class. Students are also encouraged to work with your classmates. Should you have any trouble with the homework, ask TA and instructors for help during designated office hours.

Students are expected to **read textbook before and after** each class period following the lecture schedule, which is the reading assignment. Remember lectures will be given assuming students read textbook before class.

In-Class Quiz will be given periodically 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 homework should be submitted on BB. **If answer(s) is(are) required to submit to BB, the answer(s) of the question(s) must be handwritten otherwise NO credit will be given for that work.**

There will be **one mid-term exam** and **one final exam**. The final exam is comprehensive. The exams in this course will be closed book and closed note.

If you miss any exam, NO make-up will be given for the missing exam without prior arrangement. If you have a serious conflict with an exam time, you **MUST** discuss it with the INSTRUCTOR well ahead of the scheduled exam day to make an appropriate arrangement. Exams missed due to unpredictable events such as a family emergency and a traffic accident will be dealt with on a case-by-case basis if the student has a proper document(s) to prove it.

Students have 1 day after any graded work including exams is returned and/or the grade of a work is posted on BB to dispute the grade.

Collaboration

Collaboration between students is strongly encouraged for better understanding of the course material. Students are allowed to discuss homework problems and projects in terms of methodologies, but not the solutions of a problem, which means that each student **MUST** do the actual work independently.

Inappropriate collaboration (also known as **cheating**) includes:

- Using all or parts of homework, exams or projects from this year or any previous year
- Sharing of work such as graphs, equations, calculations or any other derived material that was not presented to the class
- Talking, passing information or using inappropriate materials during an exam Anyone found to be participating in inappropriate collaboration may be immediately failed from the course.

Office Hours

Office hours are times I have specifically set aside to be available to students. During office hours, you can come to my office; you don't need an appointment. I may be available at other times; please email to schedule a time, or simply drop by, outside these times.

Attendance

On-time attendance at all class activities is expected. Attendance itself will not be graded, but the student is responsible for any material that was covered, and any changes to the exam dates and homework assignments announced in class. Make-up work will only be accepted if prior arrangement has been made or if a valid emergency excuse (e.g., meteor strike) is accompanied by appropriate documentation.

Other Policies

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.

Lecture Schedule

Week	Chapter	Topic
1		Introduction - Overview of Course, Review of the last Semester
2	Ch. 8.1 ~ Ch. 8.4	Flexural Stress & Flexural Strain, Second Moment of Areas
3	Ch. 8.5 ~ Ch. 8.6	Elastic Flexure Formula, Shear Force and Bending Moment Diagram
4	Ch. 8.7 ~ Ch. 8.8	Load, Shear Force, And Bending Moment Relationships
5	Ch. 8.8 ~ Ch. 8.9	Shear Stress in Beam and Design
6	Ch. 9.1 ~ Ch. 9.4	Deflection by Integration - Method of Successive Integration
7	Ch. 9.5 ~ Ch. 9.6	Singularity Functions & Deflection by Superposition Flexure
8	Ch. 9.7 ~ Ch.9.9	Statically Indeterminate Beams and Design
9	Review	Mid-Term Exam
10	Ch. 10.1 ~ Ch. 10.4	Plane Stress & Stress Transformation Equation
11	Ch. 10.5 ~ Ch. 10.8	Principal Stress & Maximum Shear Stress, Mohr's Circle for Stress
12	Ch. 10.5 ~ Ch. 10.8	Principal Stress & Maximum Shear Stress, Mohr's Circle for Stress
13	Ch. 10.8 ~ Ch. 10.11	Principal Strain & Maximum Shear Strain, Mohr's Circle for Strain
14	Ch. 10.8 ~ Ch. 10.11	Principal Strain & Maximum Shear Strain, Mohr's Circle for Strain
15	Ch. 10.13 ~ Ch.10.15	Thin-Walled Pressure Vessels & Combined Loads
16	Ch. 11.1 ~ Ch. 11.3	Columns & Fracture Theory
17	Ch. 11.4 ~ Ch. 11.7	Columns: Buckling
18	Review	Final Exam