Spring
2023

SCUPI
Sichuan University - Pittsburgh Institute

ENGR 0145 Statics and Mechanics of Materials II

Instructor: Dr. Jangho Yoon
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Office hours: Monday 14:00 PM ~ 17:00 PM & Tuesday, Thursday: 09:00 AM ~ 11:00 AM
Not available on Wednesday & Any other days - by appointment only
Class time & Location: Sec I – Mon. 08:15 - 11:00 AM, Liberal Art Building Zone 3 Room #202
Sec II – Tue. 01:50 - 04:25 PM, Teaching Building D #403

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, and Castigliano's theorem.
- 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

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

Grading Breakdown

In & Out – Class Work	10 %
Three Term Exams	45 % (15 % each, Apr. 07, May 05 & Jun 09)
One Final exam	45 % (Final Week)

Grading Scale

While grades may be curved, there is no guarantee of any curve. However, in order to receive a grade of D or better and to be eligible to take Make-Up exam, a student will have to reach 50 % of the total possible points. If any student fails this course and takes Make-Up exam, the highest grade that student can receive is D. The grading scale is

$A \geq 90\%$		$A^- \geq 85\%$
$B^+ \geq 80\%$	$B \geq 76\%$	$B^- \geq 73\%$
$C^+ \geq 70\%$	$C \geq 66\%$	$C^- \geq 63\%$
$D^+ \geq 61\%$		$D \geq 60\%$

In & Out - Class Work and Exams

In each class, there will be the In-class work and the Out-class work. The In-class work will be given at the during class period to evaluate the understandings of the lecture. The Out-class work will be given after each class period and is to help you practice the learned material. You will work on and complete these problems as an individual within given time.

There will be **three term exams** and **a final exam**. The final exam will be comprehensive. The exams in this course will be closed book and closed note. All the necessary formulas will be provided.

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 BEFORE the scheduled day for the exam 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 one week after the any graded work including exams is returned and/or the grad of a work is posted on BB to dispute the grade.

It is important that you show the work in an organized manner clearly showing your thought process in solving the assigned problems. Instructor cannot give credits for the answer(s) that is(are) not readable and/or understandable.

All assigned problems must be solved **with appropriate units**. Otherwise, you will be penalized for any missed unit or wrong unit. You will also be penalized for using an excessive number of significant figures

e.g., $\pi = 3.1415926535897932385$ instead of $\pi = 3.14$

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. Current office hours will be posted on the class website.

Be prepared to show me what work you have already done!

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:

Please honor the following: do not come late; do not disturb the class by having conservation with others; do not work on any other class materials.

Those students who fail to follow these policies may be asked to leave the class.

The instructor also 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 in class

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Lecture Schedule

Week	Chapter	Topic
1		Introduction - Overview of Course, Review of the last Semester
2	Ch. 8.1 & 8.4	Second Moment of Areas
3	Ch. 2, 3 & 5	Flexural Stress & Strain and Elastic Flexure Formula
4	Ch. 8.6 ~ Ch. 8.7	Shear Force and Bending Moment Diagram,
5	Ch. 8.8 ~ Ch. 8.9	Shear Stress in Beam and Design
6	Ch. 9.1 ~ Ch. 9.5	Deflection by Integration - Method of Successive Integration And Singularity Functions
7		**Exam I -** Apr. 07
8	Ch. 9.5 ~ Ch. 9.8 Handout	Deflection by Superposition Flexure, Composite Beams and Statically Indeterminate Beams
9	Ch. 9.8 ~ Ch. 9.9 Handout	Statically Indeterminate Beams and Design Castigliano's Theorem
10	Ch. 10.1 ~ Ch. 10.3	Plane Stress
11		**Exam II -** May 05
12	Ch. 10.4 ~ Ch. 10.6	Principal Stress & Maximum Shear Stress Stress Transformation Equation, Mohr's Circle for Stress
13	Ch. 10.7 ~ Ch. 10.14	Plane Strain, Strain Transformation Equation Principal Strain & Maximum Shear Strain, Mohr's Circle for Strain
14	Ch. 10.13 ~ Ch. 10.14	Thin-Walled Pressure Vessels & Combined Loads
15	Ch. 11.1 ~ Ch. 11.3	Fracture Theory
16		**Exam III** - Jun 09
17	Ch. 11.4 ~ Ch. 11.7	Columns: Buckling
18		**Final Exam**