

COE 3001 C – Mechanics of Deformable Bodies – Fall 2015

Meeting Times: Tu&Th 4.35pm-5.55pm
Classroom: Instruction Center, room 213
Grader: Mr. Cheng Zhu <chengzhu@gatech.edu>

Prerequisites: COE 2001 Statics (or equivalent). Pre-/Corequisites: MATH 2403, 2413 or 24X3.
Textbook: *Mechanics of Materials*, 8th edition, J.M. Gere & B.J. Goodno, 2013, CENGAGE Learning, ISBN-13:9781111577735

Learning Objectives:

1. Develop an ability to visualize and understand the fundamental behavior of structures and solids
2. Develop an understanding of assumptions and idealizations commonly used for analysis of structures and solids
3. Learn methods of computing stresses in several types of structural and machine components
4. Learn the fundamental approach for determining internal forces and stresses in indeterminate structures: use of equations of equilibrium, force-temperature-deformation relations, and expressions for the geometry of the deformations
5. Develop a basic knowledge of approaches to design of structural and machine components

Outline & Schedule:

Note that the schedule of topics may have to be updated during the semester. Chapter and section numbers indicated in the table below refer to the 8th edition of the textbook. Reading is not graded but it is strongly recommended to read the book according to the schedule indicated to be successful in this course.

Week	Lecture	Date	Topics	To Read Before Class
1	1	08/18/15	Review: problem solving, statics.	Appendices B&C + 1.1-2
	2	08/20/15	Stress & Strain: definition of stress and strain, stress-strain diagrams, elasticity, plasticity and Hooke's law.	Appendix I + 1.3-8
2	3	08/25/15		
		4	08/27/15	
3	5	09/01/15	Axial Deformation: deformation of axially loaded members, statically indeterminate structures, thermal deformation.	2.1-7
		6		
4	7	09/08/15	Torsion (1/2): torsion of circular bars, power transmission in circular shafts.	12.6 + 3.1-7
		8		
5	9	09/15/15	Exam 1	
		10		
6	11	09/22/15	Stresses in Beams (1/4): normal stress in beams, properties of sections, shear stress in beams.	12.1-9, 5.1-5, 5.7-10
		12		
7	13	09/29/15	Stresses in Beams (2/4): review workshop on shear force and bending moment diagrams.	4.1-5
		14	Torsion (2/2): workshop on statically indeterminate problems and shaft assemblies with gears.	3.8
8	15	10/06/15	Stresses in Beams (3/4): design of beams for bending stresses, built-up beams, shear flow, combined stresses in beams subjected to bending and axial loads.	5.6, 5.11-12, 8.15
		16		

Outline & Schedule (*continued*):

Week	Lecture	Date	Topics	To Read Before Class
9		10/13/15	<i>Students' recession (no class)</i>	
	17	10/15/15	Stresses in Beams (4/4): composite beams, transformed section method, steel-reinforced concrete beams, doubly-symmetric beams in general loading conditions.	6.1-4
10	18	10/20/15		
		19	10/22/15	
11	20	10/27/15	Exam 2	
	21	10/29/15	Stress and Strain Transformation at a Point: principal stresses, maximum shear stress, Mohr's circle, membrane stresses, pressure vessels and pipes, principal strains, maximum shear strain.	7.1-7, 8.1-4
12	22	11/03/15		
		23		
13	24	11/10/15		9.1-5, 9.8-9, 10.1-4
		25		
14	26	11/17/15	Beam Deflection: curvature and beam deflection equation, boundary conditions, statically indeterminate beams, <i>energy methods (if time permits)</i> .	
		27		
15	28	11/24/15	<i>Thanksgiving Holiday (no class)</i>	
		11/26/15		
16	29	12/01/15	Column Buckling: energy and equilibrium, buckling of columns with different boundary conditions, <i>eccentric loading and imperfection, secant formula (if time permits)</i> .	11.1-11.6
		30		
Thursday 12/10/2015 - 2.50pm-5.40pm - Final Exam				

Grading: Final grade: $F < 60\% \leq D < 70\% \leq C < 80\% \leq B < 90\% \leq A \leq 100\%$

Score: Final: 25%. Exams 1-2: 25% each = 50%. Homework 1-10: 2% each = 20%. Class work: 5%.

Exams: Exam dates are indicated in the schedule above. **All students must take the final exam and exams 1-2 at the posted times to pass the course – there are no “make-up” exams.** Exam syllabi will be posted later during the semester. Sample problems will be solved in class before exams.

Homework: Homework format requirements and due dates are indicated in the “Homework Syllabus”. The “Homework Syllabus” will be updated regularly during the semester with the list of problems assigned.

- **Homework is due at the beginning of class** on the assigned due date. Students needing extra-time need to ask permission from the instructor to submit late, before the deadline. **All late homework will be given half credit, even with permission to submit late.** Extra time will never exceed one week. No credit will be given for homework submitted more than one week after the deadline.
- Homework solutions will (usually) not be discussed in class but rather in office hours.

Class work: Three to five lectures will be dedicated to problem solving. Groups of ~5 students will work on different problems during class time. The instructor will mentor the groups and will provide hints and feedback to the whole class, based on students' questions. Each group will be responsible for writing a report to summarize their analysis, comment on their results, and explain their reasoning with their own visual communication strategy (sketches, colors, symbols). Reports will be collected at the end of class time and posted on the course website. Students will thus have access to the solution reports of the problems they worked on, as well as to the reports written by other groups on different problems. Group grades will be assigned according to the same criteria as homework.

Surveys, pop quizzes, participation: Surveys and non graded quizzes will be used regularly to adapt the pace of the lectures to students' needs. Students' engagement and feedback are essential to ensure the success of these activities. Grades obtained for homework problems and group work assigned in class will be used to determine the final grade of students who are borderline between two grades.

Academic Honor Code: Full compliance with the GT Academic Honor Code (available at www.honor.gatech.edu) is expected. Working in group on homework is allowed (and encouraged). However, each student must write up and turn in his/her own solutions. In-class exams are strictly individual.

Important notes:

- Attendance and punctuality at all lectures is expected. Missing a class is not an excuse not to submit homework. **No electronic communication is allowed during lectures or exams (i.e. no cell phones).**
- Students are allowed (and encouraged) to ask questions to the instructor during office hours, although students should try to solve problems before asking.
- Exams will be partly based on assigned homework and/or examples from lecture. In addition, it is strongly recommended to work on extra problems from the book to prepare exams.