COE 3001J Mechanics of Deformable Bodies (Fall 2026)

(3-0-3)

PREREQS: COE 2001 Statics (or equivalent), Prerequisites w/ concurrency: MATH 2403, 2413 or 24X3.

INSTRUCTOR: Prof. Don White, Mason 5142B, 404-894-5839, dwhite@ce.gatech.edu

CLASS SESSIONS: Instructional Center Rm 109, Mondays and Wednesdays, 2:00-3:15 pm

TUTORING SERVICES: In addition to our office hours, peer tutors are available for this course (and many others!) for free in-person and virtual tutoring appointments. In addition to the one-to-one appointments and drop-in help desks Clough, you can also connect for an online session in Knack. For more details, visit https://tutoring.gatech.edu/.

TEXT: Mechanics of Materials, Enhanced 9th Ed. Loose-leaf + Web Assign, Barry J. Goodno & James M. Gere, 2021 in, Cengage Learning. This book provides a wealth of examples, illustrations, explanations, & exercises in mechanics problem solving.

There is a 7-day trial option with WebAssign the publisher provides, direct from the publisher, if you are sorting out your schedule for the semester.

WebAssign is an electronic problem assignment/problem solving tool that is integrated with the textbook and with the Georgia Tech Canvas Learning Management System.

Once you purchase the book/WebAssign, you will access WebAssign via the Link provided at the top of the course Modules page on Canvas. You do not need to provide any access code or course key if you are using the 7-day trial. You can continue through the general Cengage web interface to access "Deformable Bodies – COE 3001-J," where you can access WebAssign and the e-book. Once you have made a purchase, Cengage will provide an access code you should enter when you are first prompted for it. At that point, Cengage will stop reminding you to make a purchase ☺.

Here is a 3 minute video provided by the publisher aimed at guiding you through the purchase and access to your course materials: https://startstrong.cengage.com/webassign-canvas-ia-no/.

Once you are up and running with WebAssign, please complete the *Practice with Web Assign* assignment ASAP. This is an easy brainless set of exercises to familiarize you with the WebAssign system. Let me know of any snags you may encounter. Take note of the *Ask Your Teacher* link in each of the WebAssign problems. This link is an excellent way to contact me about a particular portion of a problem you are struggling with, etc.

MOTIVATION & OBJECTIVES: This is a key fundamentals course pertinent to many areas of engineering practice. The essential focus in the course is on learning fundamentals of the mechanics of deformable bodies, and applying these fundamentals in various creative ways to solve engineering problems. The efforts you can put into developing a strong understanding of the concepts and methods in this course will pay dividends in your subsequent engineering coursework and practice. The key objectives of the course are to:

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

COURSE FORMAT: The CEE 3001J class sessions will be in-person at Mason 5134.

The course has 13 modules arranged in weekly blocks. Homework will be assigned at the beginning of each week and is due by midnight of the following Sunday. All 14 HW assignments will be in WebAssign, and will require submission of answers in WebAssign plus submission of a pdf scan of your handwritten work on all problems directly to a corresponding Assignment page on Canvas. 50 % of your HW grade will be based on your answers to the WebAssign questions and 50 % will be based on the completeness of your handwritten work.

We will have four (4) in-class Quizzes, at the Wednesday class session in Weeks 6 (Sept 25), 10 (Oct 23), 12 (Nov 6) and Monday of Week 15 (Nov 25).

The Final Exam is cumulative, but with emphasis on the material from HW 13 and 14. The quizzes and the final exam will be administered in-person in-class.

GRADING: HW, 14 assignments at approximately 1 % each on ordinary weeks, and at approximately 0.5 % each for the HW submissions just before and just after each quiz (12 %), Four Quizzes (17 % each), and Final Exam (20 %). Your lowest Quiz/Final Exam Grade will be dropped. You are exempt from the final exam if you are satisfied with your letter grade standing at the completion of all the Homeworks and Quizzes.

My letter grade policy is A $\geq$ 85, B $\geq$ 75, C $\geq$ 65 and D $\geq$ 55. I will lower the bar to pick you up a letter grade at the end of the semester, if you are close to the boundary and you have participated fully in the course (e.g., active attendance, active participation in working the homework throughout the semester, etc.)

OUTLINE:

Week	Tentative Topics & Deliverables	Text Sections
1 (8-19 to 8-25)	1. Introduction & Review	1.1 to 1.3, App. A & B
	1.1 Course Overview	
	1.2 Statics Review	
	2. Basics of Stress & Strain	1.4 to 1.8
	2.1 Stresses in Axially Loaded Bars	
	2.2 Single & Double Shear in Fasteners	
	HW 1 – Review of Statics; Basic Stress-Strain Calculations (due Sunday 8-25)	
2 (8-26 to 9-01)	2.3 Axial Stress and Strain	1.4 to 1.8
	2.4 Basic Stress-Strain Behavior of Structural Steels	
	2.5 Additional Considerations, Axial Stress-Strain	
	2.6 Calculation of Normal Stress & Strain, Examples	
	2.7 Calculation of Shear Stress, Examples	
	HW 2 – Basic Stress & Strain Calculations (due Sunday 9-01)	
3 (9-02 to 9-08)	2.8 Shear Stress & Strain	1.9 & 1.10
	2.9 Allowable Stress & Allowable Load, Design	
	2.10 General 3D Stress, Generalized Hooke's Law	
	3. Axial Deformation & Analysis of Statically Indeterminate Structures	2.1 to 2.3
	3.1 Axial Load-Deformation, Prismatic Bar Assemblies	
	3.2 Axial Load-Deformation of Nonprismatic Bars	
	HW 3 – Basic Stress & Strain, Axial Deformation of Bars & Bar Assemblies (due Sunday 9-08)	
4 (9-09 to 9-15)	3.3 Statically Indeterminate Bar Assemblies - Intro	2.4 to 2.6
	3.4 Statically Indeterminate Bar Assemblies – Integrated Examples	
	3.5 Behavior of Threaded Bolts and Rods	
	3.6 Stresses on Inclined Cuts in Axially Loaded Bars	

	HW 4 – Axial Deformation & Analysis of Indeterminate Structures (due Sunday 9-15)	
5 (9-16 to 9-22)	4. Torsion of Circular Shafts	3.1 to 3.7
	4.1 Deformation of Bars Loaded in Torsion	
	4.2 Shear Stress & Angle of Twist vs. Torque	
	4.3 Off-Axis Stress Components in Torqued Circular Shafts	
	4.4 Bars in Torsion Connected by Gears	
	4.5 Design of Transmission Shafts	
	4.6 Unique Relationship between E, G and ν	
	HW 5 – Torsional Behavior of Circular Shafts (due Sunday 9-22)	
6 (9-23 to 9-29)	5. Shear Force & Bending Moment Diagrams	4.1 to 4.4
	5.1 Types of Beams, Loads & Reactions	
	5.2 Shear Forces & Bending Moments by Method of Sections	
	5.3 Graphical Method of Constructing V & M Diagrams	
	Quiz 1 on HW 1-4, Topics 1-3 (Wednesday 9-25)	
	HW 6 – Pure Shear; Design of Transmission Shafts; Beam V & M using Statics (due Sunday 9-29)	
7 (9-30 to 10-06)	5.4 V & M Diagrams, Use of Method of Sections w/ Graphical Method	4.5
	5.5 Drawing of V & M Diagrams, Synthesis of Concepts	
	6. Bending of Beams	5.1 to 5.5, App. D.1 & D.4
	6.1 Bending Deformations & Corresponding Strains	
	6.2 Calculation of Bending Stresses	
	6.3 Calculation of Basic Cross Section Properties for Bending	
	6.4 & 6.5 Beam Bending Examples	
	HW 7 – V & M Diagr. by Graphical Method; Beam Bending Stresses & Strains (due Sunday 10-06)	
8 (10-07 to 10-13)	6.6 to 6.8 Beam Bending Examples	5.6 & 5.7
	7. Bending, Advanced Topics Part 1	6.1 & 6.3, 6.4
	7.1 Behavior of Composite Beams, Transformed Section Method	
	7.2 Transformed Section Method Example	
	7.3 Doubly Symmetric Beams Subjected to Inclined Loads	
	7.4 Biaxial Bending of Doubly-Symmetric Beams	
	HW 8 – Beam Design; Transf. Sect. Method; Biaxial Bending (due Sunday 10-13)	
9 (10-14 to 10-15)	**Fall Break**	
9 (10-16 to 10-20)	8. Shearing of Beams	5.8, 5.9 to 5.11, 6.7 & 6.8
	8.1 Shear Stresses in Beams of Rectangular Cross Section	
	8.2 Beam Shear Stress Calculations	
	8.3 Additional Beam Shear Considerations	
	8.4 Shear Stress & Shear Flow in Beams	
	9. Bending, Advanced Topics, Part 2	6.5
	9.1 Bending of Unsymmetric Beams	
	9.2 Key Points & Example Calcs., Bending of Unsym. Beams	
	HW 9 – Beam Shear Stresses and Shear Flow (due Sunday 10-20)	
10 (10-21 to 10-27)	9.3 Beams Subjected to Combined P & M	5.12
	10. Plane Stress, Mohr's Circle, Pressure Vessels, Combined Loading	7.1 to 7.4
	10.1 General States of Stress, Plane Stress & Coord. Transformations	

	10.2 Plane Stress Transformations as Parametric Eqs. of a Circle	
	Quiz 2 on HW 5-8, Topics 4-7 (Wednesday 10-23)	
	HW 10 – Unsymmetric Bending; Combined Axial Load and Bending (due Sunday 10-27)	
11 (10-28 to 11-03)	10.3 Construction & Use of Mohr's Circle	7.4
	10.4 Mohr's Circle Examples	
	HW 11 – Construction & Use of Mohr's Circle (due Sunday 11-03)	
12 (11-04 to 11-10)	11.1 Spherical Pressure Vessels	8.1 to 8.4
	11.2 Cylindrical Pressure Vessels	
	11.3 Combined Stresses in Beams	
	Quiz 3 on HW 9-10, Topics 8-9 (Wednesday 11-06)	
	HW 12 – Pressure Vessels; Combined Stresses in Beams (due Sunday 11-10)	
13 (11-11 to 11-17)	11.4 & 11.5 General Combined Stress Problems	8.5
	12. Beam Deflections & Analysis of Indeterminate Beams	9.1 to 9.4
	12.1 Deflection of Beams by Integration of Moment Eq.	
	12.2a Deflection of Beams by Integration of q or V Eqs.	
	HW 13 – General Combined Loading Problems; Defl. of Beams by Integration (due Sunday 11-17)	
14 (11-18 to 11-24)	12.2b Deflection of Beams by Method of Superposition	9.5, 10.1, 10.2
	12.3 to 12.5 Analysis of Indet. Beams by Method of Superposition	& 10.4
	HW 14 – Defl. of Beams by Method of Superposition; Indeterminate Beams (due Sunday, 11-24)	
15 (11-25 to 12-01)	**Quiz 4 on HW 11-12, Topics 10-11.3 (Monday 11-25)**	
16 (12-02)	13. Column Buckling Final Instructional Day, Review for Final	11.1 to 11.3
17 (12-11)	**Final Exam, Comprehensive w/ Emphasis on HW 13 & 14, Topics 11.4-12 (2:40 to 5:30)**	

HOMEWORK POLICY: ***This course is largely about problem solving. Your time spent on thinking through and working out your hand solution to the HW is probably the most important time you will spend in the course***. One part of each HW is your written solution, scanned to pdf and uploaded directly to Canvas, and one part is your entry of your intermediate and final answers into WebAssign. Both of these parts will be equally weighted. All your written HW solutions should be done neatly with each problem clearly identified and any intermediate solution steps shown clearly and in an orderly fashion. Solutions should not be crowded or crammed onto the pages. The written portion of your HW will be graded for completeness and presentation. Final answer(s) must be underlined or boxed in. ***A 10 % GRADE DEDUCTION will be applied for solutions that do not meet this standard.*** Work should be performed only on ONE SIDE of the paper (for ease of scanning, and ease of your future use).

Homework is due at the due dates specified above. ***A 10% penalty will be assigned for late homework***. ***ZERO CREDIT*** will be assigned for ***homework submitted more than one day late***. ***Generally, you should submit all the problems you have completed at the due date. Late penalties are applied only to the late problems.***

You are encouraged to reach out to me during the office hours, and at other times by request. During off hours, one option is to reach out via Piazza. Piazza is an excellent tool for general Q&A and forum type discussions. Please use Piazza to reach out to me (and your cohorts in the class) with questions that can be answered on-line, rather than sending e-mail. You can post to Piazza anonymously if you prefer. You will be auto-registered in Piazza, and should receive an e-mail for that early this week.

On request, I can connect with you via Zoom for an on-line meeting during off times.

HW solutions will be placed on the Canvas modules page one day after the due date. You have the main responsibility to think through, check, and improve on your problem-solving skills. This is what the HW is all about! *Aakash and I are here to help you*.

HW BEST PRACTICES:

- List given information
- List what is being solved for
- Don't write overly small
- Use the whole page width
- Leave plenty of white space
- Highlight intermediate and final answers
- Don't worry about your solution "wandering" toward the answer, e.g., there isn't any need to work out the solution on scrap paper, then reorganize and write a "formal" solution. Let your submission show your thought process in working through the solution.

PRACTICE EXAMS: Example exams will be provided on the course web site one week in advance of each of the exams.

ACADEMIC HONOR CODE: I expect compliance with the GT Academic Honor Code; please read and understand this document, available at https://policylibrary.gatech.edu/student-life/academic-honor-code. ***You are encouraged to work together*** with other students on HW, as long as you work, write up and turn in your own solutions. I strongly encourage you to work extra problems from the book on your own. All quizzes and the final are to be your work alone. All quizzes and the final will be closed book and notes. You are allowed one page, one side of summary (crib) notes during each of the quizzes, five pages (your four previous crib sheets, or an updated version of them, plus one extra crib sheet, for the final. For any questions involving these or any Academic Honor Code issues, please consult me or https://policylibrary.gatech.edu/student-life/academic-honor-code.

ATTENDANCE & MISC: Attendance at all lectures is expected. Excused absences must be cleared with me in advance, by e-mail, phone, or in person. Cell phones must be off when you are in class!