AE 6114 Fundamentals of Solid Mechanics - Syllabus

Fall 2026 - Sections A and Q

Instructor Information

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General Course Information

Description

This course provides a unified introduction to the fundamental principles of solid mechanics, from nonlinear continuum mechanics to linear elasticity, with an introduction to energy methods and selected advanced topics. Students will develop the mathematical and physical framework needed to understand deformation, stress, and material response, and will learn how to formulate and solve boundary value problems central to structural analysis, materials modeling, and related research areas.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

- Formulate solid mechanics problems using the appropriate kinematic and constitutive framework, including deciding when linearized theory is adequate and when a finite-deformation description is required.
- Use tensor notation and coordinate transformations to describe deformation, strain, and stress in a frame-consistent way, including interpreting the physical meaning of the resulting measures.
- Derive and apply the governing equations for solid mechanics boundary value problems from kinematics, balance laws, constitutive relations, and boundary conditions.
- Solve representative problems in linear elasticity using analytical methods such as symmetry arguments, superposition, polar-coordinate formulations, and Airy stress functions.
- Apply energy and variational methods such as potential energy methods and Rayleigh–Ritz approximations to obtain and interpret approximate solutions in solid mechanics.

Required Course Materials

"Continuum Mechanics of Solids" by Lallit Anand and Sanjay Govindjee. Oxford University Press, 2020.

- Physical book available to purchase from Barnes & Noble or Amazon
- Online Access available free to GT students from the GT Library (https://galileogatech.primo.exlibrisgroup.com/permalink/01GALI_GIT/h3hs1c/alma99154009848 02947)

Grading Policy:

The following assignments contribute to your final grade according to the weights given.

- Homework - 20%. There are 4 homework assignments each worth 5%. A fifth, optional, homework assignment may be completed to substitute your lowest HW grade.
- Exam 1 (in-class) - 20%
- Exam 2 (in-class) - 20%
- Final Exam (cumulative of all course content) - 40% **Letter grade breakdown:**

- A >= 80%, B >= 60%, C >= 40%, D >= 30%, F < 30%
- I will occasionally make modifications to this breakdown for a particular assignment if I deemed it to have been too difficult. Such modifications will be made clear and will only be in the benefit of the students.

Course Policies

Attendance and/or Participation

- Attendance in class is not mandatory, but highly encouraged. While the instructor believes graduate students are mature enough to understand their own particular needs to best master the course content, years of experience have shown that attendance directly correlates to student success.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

Not applicable

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

- Prerequisite - COE 3001

Extra Credit Opportunities

- At the instructors discretion, I will offer an "Exam Substitution Policy" based on your performance in the Final Exam. Specifically, your grade on a particular portion of the final exam (that covers content seen in past in-class exams) will be used to also substitute one (or more) of your past in-class exam grades. It is my general policy that if you have shown mastery of the content in the final exam, it should also substitute past weak performance in the in-class exams.

Collaboration, Group Work, and Use of Generative AI

- Students working together on homerwork assignments is encouraged. Each student must turn in their own assignment which reflects their understanding but it is encouraged that you discuss how to approach problems and work together to solve the homework assignments and

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

- Late homework assignments are not accepted. Solutions are posted to the classes immediately after the due date to help prepare for in-class exams.

- In the event of an institute excused reason for missing a homework assignment. The instructor will work with the student to re-distribute that assignments grade throughout the remaining homework assignments.
- Excuses from exams must be requested in advance of the examination. Excuses will be granted only for verifiable and significant reasons. A grade of zero will be assigned for unexcused missed exams.

Additional Course Policies

Distance Learning Students (Q-Section) – For students in the distance learning section of this course

- The content of the class is delivered live in lecture (there are no PDF notes distributed). You can either join the live class on Zoom or watch the recorded lectures which will be posted on Canvas.
- The second main source of information is the required Textbook listed in the Syllabus. In Canvas I post a detailed schedule page where students will find exactly which chapters/sections of the book correspond with the content of each Topic and Lecture.
- Office hours will be held online (usually 8pm) on different dates, usually in weeks preceding homework due dates or upcoming exams. I am available to meet outside those times as well.
- Examinations will be taken online without proctoring. Details can be found below.
    - Exams will be taken online without proctoring. You will access the PDF exam on Canvas, write your solutions (either paper or on a tablet), scan your solutions (I recommend any smartphone scanning app), and upload your solutions as a pdf. ○ Exam times will be scheduled individually. Prior to each exam, I will send a message asking you to indicate your preferred time window within a specified range of days (typically including one weekend day) to help accommodate students with full-time work commitments. This flexibility is typically offered as a courtesy when feasible, but I reserve the right to revise this policy if needed.

Campus Resources for Students

Graduate Student Academic and Professional Success Resources:

A list of resources for graduate students is given on the Office of Graduate and Postdoctoral Education website. Specific information for current graduate students includes

- Academic Resources such as the Communications Center, Language Institute, Library, Catalog, Registrar, resources for conducting research, Advocacy and Conflict Resolution

resources, and how to manage unexpected situations that may impact your academic performance;

- Student Resources such as Campus Services, Child Care/Family programs, Health & Wellness, Career Services, and the Student Resource Guide; and
- *Professional Development such as the programming from the Career Center and other professional development resources and events"*

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental wellbeing. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)