

# CEE 6551 Syllabus

Advanced Strength of Materials, Section A, 3 Credits

Fall 2026

## Instructor Information

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**Instructor:** Aditya Kumar

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## General Course Information

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### Description

Study of advanced topics from mechanics of materials with application to structures. Typical topics: energy methods, failure theories, post-yield behavior, generalized bending and torsion.

### Course Learning Outcomes

- Students will be introduced to the foundations of nonlinear solid mechanics, specifically its four ingredients: deformation, forces, constitutive behavior, and geometry.
- Students will be able to formulate boundary-value problems for an arbitrary structure in three dimensions.
- The fundamentals will be motivated by applications in various areas.
- Students will be provided with enough background in mechanics and mathematics for them to learn the problems not covered in this course independently and to give them the confidence to read advanced solid mechanics and structural engineering literature.

### Required Course Materials

1. *Fundamentals of Structural Mechanics*, Second Edition. Keith D. Hjelmstad. Digital, Value, or Hardback editions are all acceptable.
2. *Non-linear Elastic Deformations*. Raymond W. Ogden. Optional textbook.
3. Lecture notes and other additional reading materials will be posted on Canvas.

**Grading Policy:**

Your final grade will be based on homework assignments (30%), two mid-semester exams (20% and 25%), and final exam (25%).

Final semester grades will be assigned as follows: A >85%; B >75%; C >65%; D >55%

**Description of Graded Components**

Please check Canvas for updates. Homeworks are due on Canvas by the specified date. Please scan your homework and upload it as a single PDF file on Canvas. Request permission in advance through email for late submissions. No late submissions will be accepted unless an extension is granted in advance of the due date.

Exams will be conducted in the classroom in hand-written format. Exams will be open-book.

## Course Policies

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**Attendance and/or Participation**

Attendance at all lectures is expected. However, please be respectful of the health and safety of your classmates and instructors. Please do not attend class if you are sick.

**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**

[Core IMPACTS](#) is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated [career competencies](#). [This resource](#) developed by the Center for Excellence in Teaching and Learning and Online Education at Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

**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.

### **Collaboration, Group Work, and Use of Generative AI**

When working on the assignments, you may work collaboratively with other students in the class. However, you must submit your own answers. Unauthorized use of any previous semester course materials, such as tests, homework, and any other coursework, other than that provided by the instructor, is prohibited in this course. Using these materials will be considered a direct violation of academic policy and will be addressed in accordance with the GT Academic Honor Code. Similarly, you may not use Generative AI applications for course assignments.

### **Pre- &/or Co-Requisites**

Undergraduate courses in statics and continuum mechanics, familiarity with calculus, linear algebra, and differential equations.

## **Campus Resources for Students**

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### **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 well-being. 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 \(gatech.edu\)](#))

### **Course Topics**

The main topics covered are:

- Preliminaries on tensors
- Deformations & the concept of strain
- Balance principles & the concept of stress
- Material Behavior (nonlinear & linear elastic, linear elasto-plastic)
- Boundary-value problems
- Energy methods
- Rayleigh-Ritz and finite element method
- Fracture