

## **CEE3055 Syllabus**

Structural Analysis I

Section A

3 Credits hours

Summer 2026

**Instructor: Dr. Rafi Muhanna**

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**Office Location: Mason 4156**

**Office Hours: Thursdays**

### **Description**

This course introduces the fundamental principles of structural analysis for both determinate and indeterminate structures. Emphasis is placed on classical analysis methods, including energy approaches, the principle of virtual work, and force and displacement methods. The course also covers essential structural modeling concepts and examines the assumptions and limitations of linear elastic structural analysis.

Upon completion of the course, students will be able to apply these fundamental concepts to analyze beams, frames, and trusses, and will develop an intuitive understanding of structural behavior, including the visualization of displacements and internal forces. This foundation serves as a prerequisite for efficient and informed structural design.

### **Part I. Determinate Structures**

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1. Introduction and classification of Structures, Loads on Structures
2. Kinematic analysis of structures
  - a. Geometrical stability – degrees of freedom
  - b. Method of Construction
3. Analysis of beams and frames
  - a. Equilibrium and support reactions
  - b. Internal forces; Bending moment, shear and axial forces
4. Analysis of trusses
5. Deflections of trusses, beams, and frames

- a. Principle of Virtual work
- b. Deflections of beams, frames, and trusses
- c. Energy methods

## **Part II. Indeterminate Structures**

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1. Method of consistent deformations– Force Method
2. Displacement Method– Slope-deflection, Stiffness Method
3. Moment-distribution Method

## **Part III. Introduction to Matrix Structural Analysis (time permitting)**

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1. Matrix structural analysis – trusses
  - a. Analytical model
  - b. Stiffness matrix and load vector in local coordinates
  - c. Coordinate transformations
  - d. System Assemblage
  - e. Analysis procedures

### **Course Learning Outcomes**

- Provide a comprehensive introduction to the structural analysis of determinate and indeterminate structures.
- Foster an understanding of the assumptions and limitations inherent in linear elastic structural analysis.
- Develop the ability to model structural systems using kinematic analysis and evaluate their geometrical stability and static determinacy.
- Enable students to analyze beams, frames, and trusses for support reactions, internal forces, and deflections.
- Cultivate the ability to interpret and visualize structural response, including deformation patterns and internal force distributions.
- Present classical methods of structural analysis, with emphasis on the principle of virtual work and energy methods.
- Introduce analytical techniques for indeterminate structures, including the force method, slope-deflection method, stiffness method, and moment-distribution method.
- Prepare students for advanced study and practical applications in structural engineering design.

## Required Course Materials

Structural Analysis, Aslam Kassimali, Cengage Learning, 5<sup>th</sup> Ed., ISBN-10: 1-133-94389-6

## Grading Policy:

All exams will be closed book during the regular class schedule. The final will be comprehensive and closed book during the Institute official final period

Homework	<b>25%</b>
Midterm 1	<b>25%</b>
Midterm 2	<b>25%</b>
Final Exam (comprehensive)	<b>25%</b>

Your final grade will be assigned as a letter grade according to the following scale:

- A 90 – 100 %
- B 80 – 89 %
- C 70 – 79 %
- D 60 – 69 %
- F 0 – 59 %

Final grades are calculated based on weighted average of homework assignments, midterm exams, and the final exam.

## Assignments

List all graded components clearly:

- Homework (weekly) – 25 %: All homework assignments are equally weighted.
- Midterm Exam(s) – Two midterm exams 25% each (closed book).
- Final Exam (comprehensive) – 25% (closed book).

## Attendance and/or Participation

- Attendance is expected.
- Participation is encouraged.

## 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.

### **Accommodation 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**

- In this course, we aim to maintain a respectful and productive learning environment. Students can expect clear instruction, timely communication, fair grading, and support during office hours. In return, students are expected to attend class regularly, come prepared, submit assignments on time, uphold academic integrity, and engage respectfully with others. Mutual respect and professionalism are essential to achieving a positive and effective learning experience.

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

- Prerequisites: Statics and Deformable bodies

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

- Students can discuss concepts.
- AI is allowed for learning.

### **Late Assignments & Missed Exams**

- Homework Assignments: Assigned every Friday and due by 11:59 PM on the following Friday. All submissions must be uploaded to Canvas ([canvas.gatech.edu](https://canvas.gatech.edu)) by the deadline.
- Late Policy: Late homework will be accepted for up to 1 day after the due date with a 20% penalty. Late submissions are allowed no more than two times during the semester and will not be accepted after solutions are posted.
- Solutions: Homework solutions will be posted weekly on Canvas.
- Exams: If you are unable to take an exam on the scheduled date, you must notify and discuss it with the instructor in advance to make appropriate arrangements.

## **Extensions Inclement Weather and Digital Learning Days**

- In the event of inclement weather or changes to campus operations, updates regarding class cancellations or a transition to digital learning will be announced on Canvas ([canvas.gatech.edu](https://canvas.gatech.edu)). Students are responsible for checking Canvas regularly for course updates.

## **Campus Resources for Students**

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### **Student Academic Success Resources:**

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at [success.gatech.edu/tutoring](https://success.gatech.edu/tutoring), email us at [tutoring@gatech.edu](mailto:tutoring@gatech.edu), or come see us at Clough Undergraduate Learning Commons, Suite 283.

### **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 \(gatech.edu\)](#))