ME 261: Mechanics of Materials

Section B

Spring Semester 2025

Instructor: **Chaitanya Krishna Vallabh**
Office: EAS Annex 202
Office hours: Thursdays 12:30 - 1:30pm **Zoom (**https://stevens.zoom.us/j/96046082219**) or in-person**; Others by appointment.
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Class times: Tuesdays and Thursdays 2:00 - 3:15 pm
Class location: Babbio 104

TAs: Nisal Hettiarachchige (**nhettiar@stevens.edu**) and Mohamed Eraky (**meraky@stevens.edu**)
TA Office Hours: TBD

Course Objective: This course is the continuation of ENGR 211 and builds towards ME361 Design of Machine Components. This course prepares students for structural design and optimization.

Course Description: Fundamental material response from a variety of loads. Concepts of stress and strain, applications including beams, columns and shafts, stresses are combined to determine principal stresses, deformation of structures and statically indeterminate structures.

Textbook: Ferdinand P. **Beer**, E. Russell **Johnston** Jr., **John** T. **DeWolf**, **David** F. **Mazurek**. "***Mechanics of Materials"***, 8th ed, McGraw Hill, 2020 / ISBN 1260113272.
Additional Reference: **R.C. Hibbeler, "*Statics & Mechanics of Solids*",** 5th ed., Pearson, 2017 / ISBN 0-13-438259-5

Class Activities: We will be doing in-class activities regularly throughout the semester, in order to do them successfully you are expected to review the lecture notes prior to the class. These in-class activities will be held every Thursday, and any changes will be announced in class in advance. The activities which cannot be completed in-class can be submitted later (check Canvas for due dates and times). Please bring your computer to class, so you may refer to the lecture notes and use any course software needed to complete the activities. **Please let me know if you are unable to attend class**.

Attendance Policy: Students are expected to attend all lectures, attending all the lectures helps students attain their course goals and accomplish the course outcomes. Under special circumstances (health issues, family emergencies, participation in sports, etc.) students may miss the lectures – prior notification to the instructor is preferred. For acquiring the Attendance credit (see below), students must at least attend 50% of the lectures (~14). Missed in-class activities can be made up with the help of a classmate, if an extension is needed prior arrangement needs to be made with the instructor.

Late Policy: **5% late penalty per day** will be applied for late assignments. Genuine and unavoidable circumstances will be considered for extension requests. **Check CANVAS for submission deadlines.**

Course Assessment:

Class activities and attendance		15%	
Homework assignments		10%	
Reading quizzes		10%	
FEA Project (SolidWorks Simulation)		20%	
Three Exams	Exam #1 (Ch1, Ch2 & Ch3)	15%	45%
	Exam #2 (Ch4, Ch5, & Ch 6)	15%	
	Exam #3 (Chapters 7-9 and 11)	15%	

Exam Policies: Students are expected to do their own individual work, no form of copying/cheating in exam will be tolerated (in accordance with the Stevens Honor Board Policies). All exams are closed book, and closed notes, an equation sheet will be allowed for each exam. Students must show full work to receive full credit, this includes complete calculations, assumptions, FBD's etc.

Topics Covered:

– Introduction – Concept of Stress – Stress and Strain (Axial) – Torsion – Pure Bending – Shear Force and Bending Moment Diagrams	– Transverse Shear – Stress Transformations – Principal Stresses, Principal Strains and Mohr Circle – Beam Deformations, Statically Indeterminate Beams – Energy Methods

Software:

- **MDSolids:** It is a software designed to assist students in the study of Mechanics of Materials. After completing the hand solution, verify that the solution is correct by solving the problem with MDSolids.
- **SolidWorks Simulation:** It is a Finite Element Analysis software for analyzing the structural behavior of mechanical components and systems.

Students with accommodations:

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and provide reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodation on a case-by-case basis. **Please notify me in advance to request academic accommodations.**

Course learning outcomes and relationship of course to program outcomes:

Student Outcome 1: (Complex Engineering Problems) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

Outcome 1-1: You are able to develop and utilize relevant free body diagrams and represent internal loads within a mechanism.

Outcome 1-2: You are able to solve 2D and 3D equilibrium problems that relate to mechanisms and machinery.

Outcome 1-3: You are able to determine the stress and strain in simple structures due to internal loads resulting from external applied forces.

Outcome 1-4: You are able to determine the deformation of beams and shafts and solve statically indeterminate problems using singularity functions and Castigliano's Theorem.

Student Outcome 2: (Design) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Outcome 2-1: You are able to perform design calculations to determine the size, load, or mechanical property required to meet a specified design criterion (e.g., maximum allowable stress).

Course Schedule: (Last Revised 01/19/2025): The following is a **tentative schedule**. Students will be notified of any changes.

ME 261 Section B - Course Schedule - Spring 2025

Week	Date	Topic	Textbook	Homework	Quiz
1	21-Jan	Course Welcome / Intro to Mech of Materials Prerequisites from Statics: Forces, Supports		**Due dates will be listed on Canvas**	
1	23-Jan	Prerequisites from statics: Free Body Diagrams, Equations of Equilibrium	1.1		
2	28-Jan	Stresses in the Members of a Structure: Normal – Shearing - Bearing Stresses	1.2	HW 1 (Review of Statics)	
2	30-Jan	Stresses in the Members of a Structure: Normal – Shearing - Bearing Stresses Stresses on an Oblique Plane	1.2		Reading Quiz (1)
3	4 -Feb	Factor of Safety & ***Recitation 1***	1.3	HW 2 (Chapter 1 & 2)	
3	6- Feb	Stress-Strain Diagram - Hooke's Law; Poisson's Ratio	2.1-2.4		
4	11-Feb	Axial - Statically Indeterminate;	2.2		
4	13-Feb	Thermal Effects on Axial Deformation	2.3		Reading Quiz (2)
5	18-Feb	No Class – Monday's Schedule			
5	20-Feb	Torsional Shear Strain and Stress & Angle of Twist;	3.1 – 3.2	HW 3 (Chapter 3 & 4)	
6	25-Feb	Indeterminate Shafts, Power Transmission			
6	27-Feb	***Recitation for Exam 1***			Reading Quiz (3)
7	4-Mar	***Exam #1 – Chapters 1 - 3***	3.3-3.4		
7	6-Mar	Bending kinematics, Flexure formula; Eccentric Axial Loading in a Plane of Symmetry	4.1-4.3		
8	11-Mar				
8	13-Mar	***Intro to FEA, C-Clamp FEA Stress Analysis***			
9	**16-23 Mar**	**Spring Recess, No Classes**			
10	25-Mar	Beams, Shear and Bending-Moment Diagrams - MoS and Graphical Method.; Relations Between w, V, and M	5.1	HW 4 (Chapters 5 - 7)	
10	27-Mar	Transverse shear (kinematics & formula)	5.2; 6.1		
11	1-Apr	***Recitation for Exam 2***			
11	3-Apr	***Exam #2 – Chapters 4 - 6***			
12	8-Apr	Stress Transformation - General Eqns; Principal Stress and Max Shear Stress	7.1 & 7.2		Reading Quiz (4)
12	10-Apr	Mohr's Circle for Plane Stress			
13	15-Apr	Principal Stress and Max Shear Stress; Mohr's Circle for Plane Stress Combined Loadings	Chap 8		
13	17-Apr			HW 5 (Chapters 8, 9, & 11)	
14	22-Apr	Deflection of Beams: Integration, Moment-Area Theorems; Statically Indeterminate Beam	9.1, and 9.2		
14	24-Apr	Deflection of Beams – Singularity Functions	9.3		
15	29-Apr	Elastic Strain Energy, Castigliano's Theorem	11.1-11.4		Reading Quiz (5)
15	1-May	***Exam 3 Review***			
16	6-May	***Exam #3 – Chapters 7- 9 and 11***			

Excepted Etiquette

The students will work both independently and collaboratively. On individual assignments and exams, you are not allowed to work together and must work independently.

Using mobile phones for texting or watching videos for entertainment is not allowed. If you need to use your phone, kindly step out of the classroom. Additionally, wearing earbuds or headphones during class is considered disrespectful to the instructor and may cause distractions. Please avoid using them while in class.

Anyone using devices in a way I or others find distracting or disturbing can lose the privilege of using electronics during class.

Respect Policy [1]

1. **If you have a question or comment in class, then raise your hand and wait for me to call on you before you begin speaking.** I will try my best to include as many people as time permits so that everyone has a chance to contribute to class discussions.
2. **Unless we're doing team-based assignments, don't talk when others (including me) are talking.** Side conversations are—at best—distracting. If you're tempted to have a side conversation, just raise your hand to see if we can have the conversation together.
3. **Silence your electronics in class.** Electronics make noise, can distract and can cause unnecessary stress. Let's be kind to each other: If your device makes noise, you will silence it immediately. And we will all check our phone before each class to make sure that we have silenced it.
4. **Do not speak across the room while taking quizzes or tests.** If you have a question, just find me at the front of the class where we can discuss quietly or raise your hand so that I can move to you.

Academic Integrity:

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at https://web.stevens.edu/honor.

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, quizzes, and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"I pledge my honor that I have abided by the Stevens Honor System."

Reporting Honor System Violations:

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at https://web.stevens.edu/honor.

Inclusivity:

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to make alternative arrangements.

Students are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary action.

Extra Guidance:

Have a question? Start a discussion on Canvas! You can also come to my office hours, or feel free to email me about any questions or concerns. **Please include the course number (ME 261) in the email subject line.**

[1] Respect Policy adapted from Prof. Nick Byrd