

JOHN A. REIF, JR. DEPARTMENT OF
**CIVIL AND ENVIRONMENTAL
ENGINEERING**



MECH 234 Hybrid course for Mechanical Engineering Students

Spring 2025

ENGINEERING MECHANICS: STATICS

- Text:**
1. Beer, Johnston, Mazurek, **Vector Mechanics for Engineers: Statics, 12th edition**, McGraw-Hill, 2016, ISBN 978-1-259-97726-8
 2. NCEES, Fundamentals of Engineering Supplied-Reference Handbook, Download pages from: <https://ncees.org/ncees-publishes-new-version-of-fe-reference-handbook/>

Classes and MECH 234-002, Monday, 10:45-12:40 and 1:00-2:00, CKB-217

Instructor : MECH 234-004, Wednesday, 10:45-12:40 and 1:00-2:00, CKB-217
Prof. G. Milano, P.E., milano@njit.edu, 239 Colton Hall, 973-596-5830

Teaching Yajing Li, PhD Candidate, yl237@njit.edu

Assistant: **Tutoring in 275-Colton Hall** - Schedule for Tutoring will be posted on the door of 275 Colton Hall. The tutoring schedule will also be posted on Canvas.

***Prerequisites:** Phys 111, Math 112. Provides an understanding of equilibrium of particles and rigid bodies subject to concentrated and distributed forces.*

Students must earn a C or better in this course to register for Strength of Materials, MECH237.

“Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

*Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing***

grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu”

Course Policies:

- ☐ Attendance is mandatory whether face-to-face or remote.
- ☐ There will be NO need for electronic devices during class time.
Turn OFF your cell phone and put it away.
You may take notes on a tablet, but do not bring a laptop to class.
- ☐ Bring your textbook to each class meeting or pages from the relevant chapter.
- ☐ Take notes. Ask questions.
- ☐ Be prepared to participate in class problem solving. Bring your calculator.

Quizzes, Exams and Grading Policies:

- ☐ There will be **three common exams**,
Exam 1: Monday, February 10, 4:15-5:45 p.m.
Exam 2: Monday, March 10, 4:14-5:45 p.m.
Exam 3: Monday, April 7, 4:15-5:45 p.m.
- ☐ **Check for conflicts now. Make other arrangements early.**
There will be a Final Exam in week 15 during Finals Week. This will be 25% of your grade.
- ☐ Quizzes / exams must have Free-Body-Diagrams with Force Vectors shown. ALL work must be shown for full credit.
- ☐ There will be NO make-up quizzes or exams unless there is documentation provided to the Dean of Students Office to validate your absence. Such circumstances may include sickness documented by a doctor or Health Service; a receipt from your mechanic for car failure; etc.
- ☐ We do NOT drop the lowest grade.
- ☐ We do NOT curve the grades.

<u>GRADING</u>	<u>GRADE RANGE</u>	<u>GRADE</u>
3 Common Exams66%	100-88	A
Homework9%	87-82	B+
Final Exam25%	81-76	B
	75-70	C+
	69-65	C
NOTE: You cannot register for MECH 237 with a D	64-60	D
	59 and below	F

Homework Policies:

- ☐ Follow the syllabus and do the homework problems listed in the Syllabus
- ☐ Not all assigned problems will be collected. Only a select few will be collected randomly.
- ☐ NO late homework will be accepted. Homework will be collected each week unless otherwise announced. Have it ready to be uploaded to **Canvas** or **Gradescope** at the specified time.
Instructions for Gradescope are on Canvas. **Upload to Canvas.**
- ☐ All homework must be submitted on quadrille 8-1/2 x 11 engineering paper sold at the NJIT bookstore or equivalent sold at any office supply store. Write on **ONLY** the front of the paper.

- All homework MUST include a Free-Body-Diagram to show Force Vectors. All work must be shown for full credit. SCAN your pages and upload to Canvas or Gradescope. Instructions to follow.
- Homework copied from a solution source will NOT receive any credit.
- This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.

Tutoring:

- Tutoring will be provided in room 275-Colton Hall. Additional information concerning the tutoring schedule will be provided in the class and posted on Canvas. Other tutoring, such as a personal Zoom session, should be arranged with the Teaching Assistant or your instructor.
- Your request for a personal Zoom session should be made at least 24 hours in advance.

Here is a [LINK](#) to additional solved “Recitation Examples”:

[Recitation Examples](#)

Useful solved problems from the Beer & Johnston text, an earlier edition.
Therefore, the problem numbers will be different, but you can find them in the current edition.

Students will be informed in advance by the instructor of any modifications or deviation from the syllabus throughout the course of the semester.

Refer to the outline on the next page:

****** Homework problems will be collected randomly per your professor or TA. Check your email for notices from your TA. NO LATE homework **can be accepted after the due date.**

***** Students enrolled in the Honors Section will be responsible for the same homework as the others. In addition to those, you will be expected to complete those additional problems shown with an asterisk.

Additional Resource: Jeff Hanson’s videos have been adopted by McGraw-Hill.
Look on YouTube for lectures by Jeff Hanson: *How to Ace Statics with Jeff Hanson.*

RECOMMENDED CALCULATOR: TI-83, TI-84, or TI-84 Plus

Problems in **Blue are links** to examples from a textbook by Beer & Johnston 6th edition **F2F**
 = Face-to-Face class meeting. **ONL** = Online class meeting with Zoom.

Week	Topic	Study pages	Homework Problems**
1 F2F	Ch. 1: Introduction Ch. 2: Statics of Particles, Trig Method (sketch force polygon)	Study p. 2 - 15 p. 16 - 25	Sketch force polygon , use Law of Sines and Cosines to solve. 2.1, 2.3, 2.5, 2.9, 2.13
2 F2F	Ch. 2: Rectangular Components Equilibrium of a Particle	p. 29 - 34 p. 38– 47	2.21 & 31, 2.23 & 32, 2.35, 2.37 2.43, 45, pulley 2.66
3 ONL	Ch. 2: Forces in Space Forces and Equilibrium in Space Review and Summary	p. 54 - 63 p. 67–70 p. 76 - 79	2. 77 & 78, 2.89 & 90 2.103, 2.111 Helpful:2-66, 89 & 90, 2-114
4 F2F	Ch. 3: Rigid Bodies: Equivalent System of Forces	p. 84– 99	3.3, 3.7, 3.21 (3.11 done on “examples.htm”)
5 ONL	Ch. 3: Couples and Force-Couple Systems	p. 119 – 130	3.71, 3.73, 3.77, 3.98
6 F2F	Ch. 3: Equivalent Systems Review and Summary	p. 138– 152 p. 161 – 168	3.101, 3.109, 3.115
7 ONL	Ch. 4: Equilibrium of Rigid Bodies Equilibrium of a Two-Force Body Equilibrium in Three Dimension	p. 170 – 187 p. 199 – 202 p. 207 – 216	4.3, 4.7, 4.17, 4.19, 4.46 4.67, 4.71 Helpful: 4.3,12,17, 26, 30, [43, 72, 101]
8 F2F	Ch. 6: Analysis of Structures: Method of Joints	p. 29 9 – 311	6.3, 6.7, 6.18, 6.19, 27 Helpful: 14, 27 [13, 28]
9 ONL	Ch. 6: Truss Analysis: Method of Sections	p. 31 9 – 328	6. 45, 6.47, 6.53, 6.57
10 ONL	Ch. 6: Frames and Machines Review and Summary	p. 334 – 341 p. 361 – 365	6.75 , 6.77, 6.87, 6.105
11 F2F	Ch. 5: Distributed Forces: Centroids and Center of Gravity	p. 23 2 - 245	5.3, 5.5, 5.7, 5.9 Helpful: [25, 32, 34, 79]
12 F2F	Ch. 5: Distributed Loads	p. 262 – 271	5.68, 5.69, 5.71, 5.76 Helpful: 5.78, 81, 83
13 ONL	Ch. 9: Moments of Inertia Parallel Axis Theorem/Composites	p. 485 – 493 p. 497 – 509	9.4 and 9.8 9.31 and 9.33, 9.41 (9.36*, 9.43*)
14 ONL	Ch. 9: continued		
15	Final Exam	Dates to be announced by Registrar at a later date.	

Revised by milano,10/2001, 1/2002, 1/2003, 1/2004, 9/2004, 1/2005, 8/2005, 9/2007, 8/2008, 8/2009, 1/2010, 1/2011, 8/2011, 8/2012, 1/2013, 8/2013, 7/2014, 8/2015, 1/2016, 1/2017, 7/2017, 1/2018, 8/2019, 7/29/2021, 7/2022, 7/2023, 1/2025.

The goal is to stay on schedule, but, if necessary, adjustments to the schedule will be announced in class.

Outcomes Course Matrix; MECH 234 Engineering Mechanics: Statics

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Methods
Student Learning Outcome 1: Provide transition from Physics (science) to Statics (engineering).			
Present engineering approach and problem solving techniques used for vector analysis while building on math and physics fundamentals relevant to force systems in equilibrium.	1, 2, 4	1	Homework, exams and success in future courses.
Illustrate applications to practical problems of torque, moments, and couples. Reinforce the application of geometry and trigonometry to realistic-type problems and demonstrate the application of math skills such as cross products and dot products.	1, 2, 4	1	Homework, bonus problems, and exams.
Student Learning Outcome 2: Master the concept of two-dimensional and three-dimensional vectors.			
Illustrate 2D vector components and orientation using trigonometry and proportions.	1, 2, 4	1	Homework and exams.
Use vivid Power Point examples to demonstrate analysis technique for force systems on beams and trusses and frames.	1, 2, 4	1	Homework and exams.
Demonstrate logical approach to spatial vectors by visualization of forces, moments. Provide basic concepts for visualizing orientation of spatial components to develop techniques using geometry and projections.	1, 2, 4	1	Homework, exams, and bonus challenge problems.
Student Learning Outcome 3: Master the concept of developing free body, diagrams and how to formulate and structure problems solving techniques which is fundamental to the solution of all engineering problems.			
Demonstrate the ability to translate a problem statement into a FBD and distinguish tensile and compressive members in trusses and frames while emphasizing the importance of vector directions.	1, 2, 4	1	Homework, bonus challenge problems, and exams.
Illustrate the approach of going from the FBD to the problem solution by formulating the appropriate equation set as applied to beams, trusses, and frames.	1, 2, 4	1	Homework, bonus challenge problems, and exams.
Provide numerous solved problems available on web that reinforce the technique of problem solving strategy.. Require numerous homework problems weekly.	1, 2, 4	1	Homework, exams and bonus challenge problems.
			Rev. 1/6/13, 9/11/13

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Program Educational Objectives

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

- **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
- **Professional Growth:** Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as academia, business, and law through further education.
- **Service:** Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Student Outcomes

Our **Student Outcomes** are what students are expected to know and be able to do by the time of their graduation:

- an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
- 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
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated 1/6/2025

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the [NJIT Library AI Citation page](#). If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.