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

NJIT New Jersey Institute of Technology

MECH 234 Hybrid course for Mechanical Engineering Students
ENGINEERING MECHANICS: STATICS

Fall 2024

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 Instructor:

MECH 234-001, Tuesday, 10:00-12:05, CKB-217
Prof. G. Milano, P.E., milano@njit.edu, 239 Colton Hall, 973-596-5830
MECH 234-003, Monday, 11:30-1:35, KUPF-211
MECH 234-HM1, Monday, 11:30-1:35, KUPF-211
Prof. M.A. Saadeghvaziri, Ph.D., P.E., ala@njit.edu, 260-Colton Hall, 973-596-5813

Teaching Assistant:

Yajing Li, PhD Candidate, yl237@njit.edu
Tutoring in 423-Colton Hall - Schedule for Tutoring will be posted on the door of 423-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 may differ with each professor:

- For Prof. Milano, there will be **three common exams** on campus. They will be on **Mondays, 4:15-5:45 p.m. on 9/30, 10/28, and 11/18.** Check for conflicts now. Make other arrangements early.
  Common exams will be 66% of your overall grade.
- For Dr. Saadeghvaziri, a modular approach will be used and announced in class.
- 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.

GRADING	GRADE RANGE	GRADE
3 Common Exams ….66%	100-88	A
Homework ……8%	87-82	B+
Final Exam ……26%	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 423-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.*

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 (* additional problems for Honors)
1 F2F	Ch. 1: Introduction Ch. 2: Statics of Particles, Trig Method (sketch force polygon)	Study p. 2 - 15 p. 16 - 25	**Sketch a force polygon**, use Law of Sines and Cosines to solve. 2.2, 2.6, 2.10, 2.11, 2.15 (2.8*, 2.12*)
2 F2F	Ch. 2: Rectangular Components Equilibrium of a Particle	p. 29 - 34 p. 38– 47	2.21 & 2.31, 2.23 & 2.32, 2.45 (2.25*, 2.47*, 2.60*, 2.62*)
3 ONL	Ch. 2: Forces in Space Forces and Equilibrium in Space Review and Summary	p. 54 - 63 p. 67–70 p. 76 - 79	2.71& 2.72, 2.91 & 2.92, 2.112 (2.75* & 2.76*, 2.87*, 2.100*, 2.113*) **Helpful**: 2-66, 89 & 90, 2-114
4 F2F	Ch. 3: Rigid Bodies: Equivalent System of Forces	p. 84– 99	3.6, 3.10, 3.21, 3.24 (3.11 & 12 done on "examples.htm")
5 F2F	Ch. 3: Couples and Force-Couple Systems	p. 119 – 130	3.70, 3.78, 3.81, 3.90 (3.80*, 3.89*)
6 ONL	Ch. 3: Equivalent Systems Review and Summary	p. 138– 152 p. 161 – 168	3.108, 3.114 (3.112*, 3.120*)
7 F2F	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	4.4, 4.7, 4.15, 4.19, 4.27 (4.13*, 4.16*, 4.35*, 4.67* and 3D: 4.94*) **Helpful:** 4.3,12, 17, 26, 30, [43, 72, 101]
8 F2F	Ch. 6: Analysis of Structures: Method of Joints	p. 299 – 311	6.2, 6.5, 6.9, 6.15, (6.27*, 6.28*) **Helpful:** 14, 27 [13, 28]
9 ONL	Ch. 6: Truss Analysis: Method of Sections	p. 319 – 328	6.45, 6.46, 6.49, (6.53*, 6.55*)
10 ONL	Ch. 6: Frames and Machines Review and Summary	p. 334 – 341 p. 361 – 365	6.77, 6.79, 6.89, 6.102 (6.105*, 6.127*)
11 F2F	Ch. 5: Distributed Forces: Centroids and Center of Gravity	p. 232 - 245	5.3, 5.5, 5.7, (5.4*) **Helpful:** [25, 32, 34, 79]
12 ONL	Ch. 5: Distributed Loads	p. 262– 271	5.68, 5.69, 5.71, 5.76 (5.78*) **Helpful:** 5.78, 81, 83
13 F2F	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.

Outcomes Course Matrix; MECH 234 Engineering Mechanics: Statics

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Methods
Student LearningOutcome 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 LearningOutcome 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

Our program educational objectives are reflected in the achievements of our recent alumni.

1 - Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 - Professional Growth: Alumni will advance their skills through professional growth and development activities such as graduate study in engineering, professional registration, and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 - Service: Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, and humanitarian endeavors.

Our student outcomes are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. 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
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering and make informed judgments which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. 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
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Rev. 4/4/12, 9/11/13, 2/13/18, 5/18/18