Fall 2020

MECH 320-101: Statics and Mechanics of Materials

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CIVIL AND ENVIRONMENTAL ENGINEERING

NJIT New Jersey Institute of Technology

MECH 320: Statics and Mechanics of Materials **Fall 2020**

Text: **Hibbeler, R.C, Statics and Mechanics of Materials, 5th Edition,**
Pearson 2014, ISBN-10: 0-13-345160-7, ISBN-13: 978-0-13-438259-3 or ISBN-10: 0-13-438259-5

Instructor: **Prof. Eduardo Castro, P.E, Email: ecastro@njit.edu**
Class: Wed., 9:00-11:50 am.

Prerequisites: *Phys 111 and Math 112, For chemical engineering and electrical engineering majors. Statics provides an understanding of the equilibrium of particles and rigid bodies, including simple machines, trusses, and frictional forces. Mechanics of materials covers pressure vessels, thermal stresses, torsion of shafts, stresses and deflection in beams, and column action.*

Week	Date	Topics	Sections, Pages
1	9/2	General Principles, Concurrent Force Systems	1.1 – 1.5, p.3-14 2.1 – 2.4, p.17-36
2	9/9	Cartesian Vectors, Position Vectors, Dot Product	2.5 – 2.6, p.40-48 2.7 – 2.9, p.52-69
3	9/16	Force System Resultants / Moment Systems	3.1 – 3.7, p.79-130
4	9/23	Equilibrium of Rigid Bodies	4.1 – 4.4, p.157-182
5	9/30	Exam #1,	
6	10/7	Structural Analysis, Method of Joints, Method of Sections	5.1 – 5.3, p.223-238 5.4, p.239-247 5.5 p.248-265
7	10/14	Frames and Machines Center of Gravity, Moment of Inertia	6.1 – 6.2, p.269-291 6.3 – 6.5, p.292-309
8	10/21	Stress and Strain Allowable Stress Design, Deformation	7.1 – 7.5, p.311-345 7.6 – 7.9, p.346-377
9	10/28	Exam #2	
10	11/4	Mechanical Properties of Materials, Poisson's Ratio Axial Loading	8.1 – 8.4, p.379-394 8.5 – 8.6, p.398-409 9.1 – 9.2, p.411-420
11	11/11	Torsion Angle of Twist	10.1 - 10.3, p.453-468 10.4 p.474-482
12	11/18	Bending, Shear and Moment Diagrams The Flexure Formula, Handout	11.1 – 11.2, p.499-515 11.4 p.529-536

13	12/2	Stress Transformation, Mohr's Circle Column Buckling	14.1 – 14.3, p.619-635 14.4 p.643-650 17.1 – 17.3, p.777-790
14	12/9	Exam #3	
15		Final Exam Week	

Basis of Grading		**Grade Distribution**	
3 Exams	65%	A = 90 – 100	D = 60 – 66
Homework	10%	B+ = 85 – 89	F = 59 or less
Final Exam	25%	B = 80 – 84	W = voluntary before deadline
Total	100%	C+ = 75 – 79	INC = special circumstances. See note below.*
		C = 67 – 74	

**An Incomplete grade may be given in rare instances when the student is unable to attend or otherwise do the course due to illness, etc. All of the missed work must be made up during the following semester.*

Policies

Attendance: Attendance will be taken at the beginning of the class.

"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"*

*Students will be consulted with by the instructor and must agree to any modifications or deviations from the syllabus throughout the course of the semester.

EXAMS:

- There will be three exams during the semester.
- There will be a Final Exam in week 15 during Finals Week.
- Exams must have Free-Body-Diagrams. ALL work must be shown for full credit.
- There will be NO make-up exams unless there is documentation provided to the Dean of Students Office to validate your absence.
- We do NOT curve the grades.

- All exams including final exam are closed book. All necessary formulas will be provided with the exam.
- The solution must illustrate the understanding of the material. Correct numerical solutions alone are insufficient for any credit.
- All answers must be accompanied by the appropriate and correct units.
- The dates of the exams are shown on the schedule above. Dates may be changed at the instructor's discretion with a minimum of 2 weeks notice.

HOMEWORK:

- All homework will be collected and graded. Presentation will account for 33% of the grade
- Late homework will be accepted up to one week after the due date. However there will be a 30-point penalty.
- Homework sets must be uploaded on Canvas before the start of the following class.
- Homework must be submitted as one pdf file with pages arranged in order by problem number.
- The homework must be written on quadrille 8½ x 11 engineering pad. Use 5-square per inch National Computation pad paper ONLY (sold at the NJIT Bookstore). The proper form consists of doing the problems on one side of 8-1/2 x11 pad paper. Also acceptable; engineering paper from office supply stores.
- On the top of each page, in the space provided, PRINT your name, course and **section**, and problem number.
- All problems must show the figure and data provided with the problem
- All problems must have a free body diagram.

Additional Note*:

Attendance will be taken at the beginning of the class.

In the case where any student misses an exam, or fails to submit an assignment on time, the ***Office of the Dean of Students*** is the only entity that would determine the legitimacy of the absence or the situation via a written email addressed to the course instructor.

It is the student's responsibility to contact the office mentioned above and make his/her case with proper documentation.

Please note that your final grade will reflect your work and calculated exactly as indicated in the above breakdown, no extra credits will be given.

Outcomes Course Matrix – MECH 320 Statics and Mechanics of Materials

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Methods/Metrics
Student LearningOutcomes 1: Identify transition concepts from Physics (science) to Engineering Mechanics.			
Present the engineering approach and problem solving techniques.	1	1	Homework and exams
Present approach of going from the equilibrium of particles to that of rigid bodies.	1	1	Homework and exams.
Student LearningOutcomes 2: Formulate, diagram, and solve FBD problems.			
Require FBD's for all problems.	1	1	Homework and exams.
Illustrate the problem solution by formulating the appropriate equation set.	1	1	Homework and exams.
Student LearningOutcomes 3: Analyze the mechanical behavior of materials under various load conditions.			
Present various aspects of stress, strain and deformation relationships and their application to various engineering problems.	1	1	Homework and exams.
Provide examples of several analytical methods to determine the mechanical behavior of materials under various load conditions.	1	1, 2	Homework and exams.
Student LearningOutcomes 4: Apply problem solving techniques to real world situations.			
Provide analytical techniques for the types of mechanics problems, which commonly occur in the industries, which employ chemical engineers.	1, 2	1	Homework and exams.
Provide development of structured problem solving techniques for various classes of mechanics problems.	1	1	Homework and exams.

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, research and development, 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, charitable giving and other 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 situations 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

Revised: 2/13/18

*JB 01/05/2015