New Jersey Institute of Technology
Department of Civil and Environmental Engineering

MECH 320- 101 - Statics and Mechanics of Materials — Fall 2017

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 10: 0-13-438259-5

Referenced Text: NCEES, Fundamentals of Engineering Supplied-Reference Handbook, latest edition, (or reproduce pages from: http:/www.ncees.org/exams/study_materials/fe_handbook/)

Instructors: Prof. Joseph Baladi, P.E, P.P. Email: joseph.baladi@njit.edu
Central King Building Room: 223. Wed 6:00 PM – 9:05 PM

Tutoring: Tutoring will be available, schedule will be emailed to students.

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	Topics	Sections, Pages	Homework Problems
1	General Principles, Concurrent Force Systems	1.1 – 1.5, p.3-14 2.1 – 2.4, p.17-36	2- 3, 10, 19, 23, 30, 35
2	Cartesian Vectors, Position Vectors, Dot Product	2.5 – 2.6, p.40-48 2.7 – 2.9, p.52-69	2- 38, 40, 51 & 52, 2- 62, 65, 75
3	Force System Resultants / Moment Systems	3.1 – 3.7, p.79-130	3- 5, 10, 11, 39, 58, 64, 75
4	Equilibrium of Rigid Bodies	4.1 – 4.4, p.157-182	4- 3, 6, 15, 21, 42, 54
5	Quiz #1 Structural Analysis, Method of Joints	5.1 – 5.3, p.223-238	5- 3, 6, 10
6	Structural Analysis, Method of Sections, Frames and Machines, Handout.	5.4, p.239-247 5.5 p.248-265	5- 20, 26, 30 5- 48, 51
7	Center of Gravity, Moment of Inertia	6.1 – 6.2, p.269-291 6.3 – 6.5, p.292-309	6- 21, 36, 37, 41 6- 61, 69, 86, 90
8	Stress and Strain Allowable Stress Design, Deformation	7.1 – 7.5, p.311-345 7.6 – 7.9, p.346-	7- 5, 11 7- 31, 34

		377	
9	Mechanical Properties of Materials Poisson's Ratio	8.1 – 8.4, p.379-394 8.5 – 8.6, p.398-409	8- 1, 7, 13 8- 21, 23
10	Quiz #2 Axial Loading	9.1 – 9.2, p.411-420	9- 2, 3, 19
11	Torsion Angle of Twist	10.1 - 10.3, p.453-468 10.4 p.474-482	10- 6, 9, 14, 34 10- 37
12	Bending, Shear and Moment Diagrams The Flexure Formula, Handout	11.1 – 11.2, p.499-515 1.4 p.529-536	11- 2, 3, 6 11- 73
13	Quiz #3 Stress Transformation, Mohr's Circle	14.1 – 14.3, p.619-635 14.4 p.643-650	14- 3, 6, 11, 15 14- 44, 50
14	Column Buckling	17.1 – 17.3, p.777-790	17- 7, 9, 36
15	Final Exam Week		

Basis of Grading

Homework	10%
Class Participation	5%
Quizzes	60% (20% each)
Final	25%
Total	100%

Grade Distribution

A = 88 to 100
B+ = 82 to 87
B = 76 to 81
C+ = 70 to 75
C = 65 to 69
D = 60 to 64
F = 59 or less
W = Voluntary before deadline

Incomplete 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.

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Policies

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

*The NJIT Honor Code will be upheld and any violations will be brought to the immediate attention of the Dean of Students.

*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.

QUIZZES: All quizzes and finals will be "Closed Book". Only the FE Handbook is permitted as a resource, but NO notes may be added. You should not write in the FE Handbook.

The quizzes will be given approximately at the end of the fourth, eighth and twelfth weeks. Information regarding the exact dates and the times will be provided by the instructor.

No make-up quizzes will be given. Instead, the weight for the final examination may be proportionately higher to make up the legitimately missed quiz. (Note from a physician, etc).

HOMEWORK: Problems on the course outline sheet are to be solved and submitted at the beginning of the first lecture in the week following the assignment. Homework will be graded and returned to the student during the following week. To obtain full credit, you must submit the work on time and in the proper form. A minimum of 70% of the homework must be submitted to receive a passing grade.

1.	Use 5-square per inch National Computation pad paper ONLY (sold at the NJIT Bookstore). Problems should be done on one side of the 8-1/2 x 11 pad paper.
2.	On the top of each page, in the space provided, Print your instructor's name, section, problem number, student's name (LAST, FIRST) date, and page number.
3.	The problems must be presented in numerical order as assigned, with one problem per page. Letters and numbers must be neat, clear and legible.
4.	Draw neat, clear, free body diagrams as required. Use a straight edge or other drawing instruments as needed.
5.	Box in the final answer accompanied by its units. DO NOT HAND IN CLASS NOTES.
6.	Staple the problems in proper numerical order with a single staple in the upper left-hand corner.

Additional Note*:

Attendance will be taken at the beginning of the class and could affect your final grade.

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In case of any student misses a class / quiz, or fail 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 hos/her case with proper documentations.

MECH 320- Statics and Mechanics of Materials

Description:

Students study the equilibrium of rigid bodies, including simple machines and trusses, with emphasis on two-dimensional problems using scalar methods. The mechanics of deformable bodies including pressure vessels, torsion of shafts, stresses in beams and column action are also studied.

Prerequisites: Math 112 - Calculus II
Phys 111 - Physics

Textbook(s)/Materials Required:

Hibbeler, R.C., Statics and Mechanics of Materials, Prentice Hall, 2004.

Course Objectives:

1. To provide transition from Physics (Science) to engineering mechanics.
2. To master the concept of free body diagrams.
3. To develop an understanding of the kinds of stress and deformation and the mechanical behavior of materials under various load conditions.
4. To develop an ability to formulate and apply problem solving techniques to real world situations.

Topics:

Introduction to Vectors
Equilibrium of a Particle in Space
Couples and Moments
Equilibrium of a Rigid Body
Trusses
Centroids and Moments of Inertia
Friction
Introduction to Stress and Strain
Axial Deformations
Statically Indeterminate Stresses
Thermal Stresses
Torsion
Bending and Shear Stresses
Shear and Moment Diagrams
Pressure Vessels
Deflections; Superposition
Columns

Schedule: Lecture/Recitation- 1-1/2 hour class, twice per week

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Laboratory- none

Professional Component: Engineering Topics

Program Objectives Addressed: 1, 2

Prepared By: Prof. Ding **Date:** 11/02/06

Course Objectives Matrix – MECH 320 Statics and Mechanics of Materials

Strategies and Actions	**Student Learning Outcomes**	**Outcomes (a-k)**	**Prog. Object.**	**Assessment Methods/Metrics**
Course Objective 1: Provide transition from Physics (science) to Engineering Mechanics.				
Present the engineering approach and problem solving techniques.	Learn problem-solving techniques while building on engineering science and science.	a, e	1	Homework and exams
Present approach of going from the equilibrium of particles to that of rigid bodies.	Learn the techniques of problem solving based upon the use of equilibrium equations.	a, e	1	Homework and exams.
Course Objective 2: Master the concept of developing free body diagrams and how to formulate and structure problem solving techniques which is fundamental to the solution of all engineering problems.				
Require FBD's for all problems.	Learn the technique of translating a problem statement into a FBD by repetition of many problems.	a, e	1	Homework and exams.
Illustrate the problem solution by formulating the appropriate equation set.	Learn the techniques of problem solving based upon the use of FBD's.	a, e	1	Homework and exams.
Course Objective 3: Develop an understanding of the kinds of stress and deformation, and 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.	Learn how to determine stresses and deformations for a wide range of simple practical structural problems.	a, e	1	Homework and exams.
Provide examples of several analytical methods to determine the mechanical behavior of materials under various load conditions.	Understand different types of mechanical behavior of materials, e.g., thermal expansions, buckling loads, and limit loads and factor of safety for simple practical structural problems.	a, e	1, 2	Homework and exams.

Course Objective 4: Develop an ability to formulate and 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.	Learn the techniques for solving problems involving pressure vessels and simple structural steel design.	a, d, e	1	Homework and exams.
Provide development of structured problem solving techniques for various classes of mechanics problems.	Understand various problem-solving techniques including FBD's, superposition, and compatibility conditions for statically indeterminate problems.	a, e	1	Homework and exams.

CEE Mission, Program Objectives and Program 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 objectives are reflected in the achievements of our recent alumni.

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

2 – Professional Growth: Recent 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: Recent alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, civic organizations, and humanitarian endeavors.

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

(a) ability to apply knowledge of math, science, and engineering
(b) ability to design and conduct experiments, as well as interpret data
(c) ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function multi-disciplinary teams

(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of ethical and professional responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) ability to use techniques, skills and modern engineering tools necessary for engineering practice

Revised 8/28/13