Summer 2019

MECH 235-111: Statics

Sunil Saigal

NEW JERSEY INSTITUTE OF TECHNOLOGY

Department of Civil & Environmental Engineering

SUMMER 2019
MECH 235 STATICS
SECTION: 111

MAY 20 – JUNE 27, 2019

Text: Beer, Johnston, Mazurek, **Vector Mechanics for Engineers: Statics, 11th edition**, McGraw-Hill, to be purchased directly from McGraw-Hill publishers

Location: KUPF 118

Time: Tuesday, Wednesday, Thursday. 06:00 – 09:00PM

Instructor: Prof. S. Saigal
Email: saigal@njit.edu, 213 Colton Hall, 973-596-5443

Teaching Assistants: Mandeep Pokhrel, Marwa Mohsen Korayem

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

SYLLABUS

Class	Topic	Study pages	Homework Problems
1	Ch. 1: Introduction Ch. 2: Statics of Particles, Trig Method (sketch force polygon)	Study p. 2 - 14 p. 16 - 25	Sketch force polygon, use Law of Sines and Cosines to solve. Ch. 2: 3, 6, 9, 12, 19
2	Ch. 2: Rectangular Components Equilibrium of a Particle	p. 29 - 35 p. 39– 46	Ch. 2: 22, 34, 36, 38 Ch. 2: 43, 45, 48, 66
3	Ch. 2: Forces in Space Forces and Equilibrium in Space Review and Summary	p. 52 - 62 p. 66–70 p. 75 - 78	Ch. 2: 71, 72, 77, 78 Ch. 2: 100, 103
4	Ch. 3: Rigid Bodies: Equivalent System of Forces Scalar Products (Dot Products)	p. 82– 99 p. 105-113	Ch. 3: 1, 5, 9, 24, 29 Ch. 3: 37, 3.43 find the angle Ch. 3: 55, 59
5	Ch. 3: Couples and Force-Couple Systems Equivalent Systems Review and Summary	p. 120 – 128 p. 136– 150 p. 161 – 168	Ch. 3: 71, 72, 78, 87, 91 Ch. 3: 101, 105, 115
6	Ch. 4: Equilibrium of Rigid Bodies Equilibrium of a Two-Force Body Review and Summary	p. 170 – 184 p. 195 – 198 p. 225 – 229	Ch. 4: 3, 7, 19, 25, 35 Ch 4: 68, 74
7	Ch. 5: Distributed Forces: Centroids and Center of Gravity	p. 230 - 244	Ch. 5: 3, 5, 8, 9
8	Ch. 5: Distributed Loads	p. 262– 268	Ch. 5: 66, 68, 70, 76
9	Ch. 6: Truss Analysis: Method of Joints	p. 298 – 309	Ch. 6: 3, 6, 14, 18
10	Ch. 6: Truss Analysis: Method of Sections	p. 317 – 324	Ch. 6: 43, 45, 52, 55
11	Ch. 6: Frames and Machines Review and Summary	p. 330 – 339 p. 361 – 365	Ch. 6: 77, 91, 102, 105
12	Ch. 9: Distributed Forces: Moments of Inertia	p. 485 – 491 p. 498 – 506	Ch. 9: 4 and 8 composites, Ch. 9: 32 and 34, 44
13	Ch. 9: Parallel Axis Theorem	p. 513 – 519	Ch. 9: 72, 73, 74
14	Review		
15	Final Exam	Last Day of Class	

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

Exams:
There will be an in-class exam each Thursday of the class. The material covered in the exam will be that covered on previous Thursday and immediate preceding Monday and Wednesday. These in-class exams will constitute 80 percent of the grade.
A Final Exam will be given on the last day of the class. The topics for this exam will be announced in advance. The Final Exam will constitute 20 percent of the grade.

Course Policies:

- Attendance is mandatory
- Please turn off all electronic devices (including cell phone, laptop, tablet) during class time.
- Bring your textbook to each class meeting or pages from the relevant chapter.
- Bring your calculator.

Grading Policy:

ITEM	TIME	GRADE (%)
Class Exams	Per Class Schedule	80
Final Exam	Finals Week	20
TOTAL		100

- There will be NO make-up quizzes or exams unless there is documentation provided to the Dean of Students Office to validate your absence.
- Quizzes and Exams must have Free-Body-Diagrams with Force Vectors shown.
- ALL work must be shown for full credit.

The grade ranges are:

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

W = Voluntary before deadline (school schedule)

Incomplete = given in rare instances where the student is unable to attend or otherwise do the work of the course due to illness, etc. The grade must be made up in the next semester by completing all of the missed work.

Note: Students must earn a C or better in this course to register for Strength of Materials, MECH 237.

Homework Policies:

- Follow the syllabus and do the homework problems listed in the Syllabus
- Have your homework ready each class meeting.
- Homework may be collected on a random basis. Not all assigned problems will be collected. Only a select few will be collected randomly.
- NO late homework will be accepted.
- All homework MUST include a Free-Body-Diagram to show Force Vectors. All work must be shown for full credit.
- Homework NOT submitted will earn MINUS points deducted from your overall grades.

Helpful Suggestions:

- Take notes and pay attention.
- Ask questions.
- Participate with board work and/or class problem solving.

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Identify transition from Physics (science) to Statics (engineering).			
Present engineering approach and problem solving techniques used for vector analysis.	1	1	Homework, exams and success in future courses.
Illustrate applications to practical problems of torque, moments, and couples.	1	1	Homework, bonus problems, and exams.
Student Learning Outcome 2: Analyze and calculate two-dimensional and three-dimensional vectors.			
Illustrate 2D vector components by orientation using trigonometry and proportions.	1	1	Homework and exams.
Use vivid Power Point examples to demonstrate analysis technique for force systems on beams and trusses and frames.	1	1	Homework and exams.
Demonstrate logical approach to spatial vectors by visualization of forces, moments.	1	1	Homework, exams, and bonus challenge problems.
Student Learning Outcome 3: Diagram and employ free body diagrams to formulate and analyze solution of engineering problems.			
Require FBD's, for all problems and emphasize importance of vector directions.	1, 2	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.	1, 2	1	Homework, bonus challenge problems, and exams.
Provide numerous solved problems available on web. Require numerous homework problems weekly.	1, 2	1	Homework, exams and bonus challenge problems.

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