MECH 234 and MECH 235
ENGINEERING MECHANICS: STATICS

Fall 2016

Text:
(or reproduce pages from: http://www.ncees.org/exams/study_materials/fe_handbook/)

Instructors:
- MECH 234-001: Day Section Hybrid
  On-line Lecture, Thursday, 1:00-2:25
  In-class Recitation, Mon., 2:30-3:55, KUPF-108: Prof. G. Milano, P.E., milan@njit.edu, 239 Colton Hall, 973-596-5830
- MECH 235-001: Day Section Hybrid
  On-line Lecture, Thursday, 1:00-2:25
  In-class Recitation, Mon., 11:30-12:55, KUPF-209: Prof. G. Milano, P.E., milan@njit.edu, 239-Colton Hall, 973-596-5830
- MECH 234-101: Mon., 6:00-9:05 p.m., FMH-305, Prof. H. Fox, hfox63@hotmail.com
- MECH 234-103: Thur., 6:00-9:05 p.m., CKB-315, Prof. H. Fox, hfox63@hotmail.com
- MECH 235-101: Tues., 6:00-9:05 p.m., FMH305, Prof. H. Fox, hfox63@hotmail.com

Teaching Assistants: Tutoring in 423-Colton Hall - Schedule for Tutoring will be posted on the door of 423-Colton Hall. Schedule of hours will be sent to you by your instructor.

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.

Below are additional LINKS to “Course Information” and “Recitation Examples”:

<table>
<thead>
<tr>
<th>Additional Course Information</th>
<th>Recitation Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructors, Tutoring, Grading, and Homework Instructions</td>
<td>Useful solved problems from the Beer &amp; Johnston text</td>
</tr>
</tbody>
</table>

Problems in Blue are links to examples from a textbook by Beer & Johnston 6th edition, found at the Reserve Desk, Library.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Study pages</th>
<th>Suggested Homework Problems**</th>
</tr>
</thead>
</table>
| 1    | Ch. 1: Introduction  
     Ch. 2: Statics of Particles, Trig Method | Study p. 2 - 14  
p. 16 - 25 | 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  
     Equilibrium of a Particle in Space  
     Review and Summary | p. 52 - 62  
p. 66–70  
p. 75 - 78 | Ch. 2: 71& 72, 77 & 78  
Ch. 2: 100, 103  
**Helpful:2-66, 89 & 90, 2-114** |
| 4    | Ch. 3: Rigid Bodies:  
     Equivalent System of Forces | p. 83–99 | Ch. 3: 1, 5, 9, 24 and 29 |
| 5    | Ch. 3: Dot Product, Moment  
     About an Axis | p. 105 - 114 | Ch. 3: 35, 37 and 38, 47 |
| 6    | 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 |
| 7    | Ch. 4: Equilibrium of Rigid Bodies  
     Equilibrium of a Two-Force Body  
     Review and Summary | p. 170 – 183  
(FBD’s, 184)  
p. 195 – 198  
p. 225 – 229 | Ch. 4: 3, 7, 19, 25, 35  
Ch 4: 68, 74  
**Helpful: 4.3,12, 17, 26, 30, [43, 72, 101]** |
| 8    | Ch. 6: Analysis of Structures:  
     Method of Joints | p. 298 – 309 | Ch. 6: 3, 6, 14, 18  
**Helpful: 14, 27 [ 13, 28 ]** |
| 9    | Ch. 6: Truss Analysis:  
     Method of Sections | p. 317 – 324 | Ch. 6: 43, 45, 55 |
| 10   | Ch. 6: Frames  
     Review and Summary | p. 330 – 339  
p. 361 – 365 | Ch. 6: 77, 91, 102, 105 |
| 11   | Ch. 5: Distributed Forces:  
     Centroids and Center of Gravity | p. 230 - 244  
p. 249 - 257 | Ch. 5: 3, 5, 8  
Ch 5: 34, 40  
**Helpful: [ 25, 32, 34, 79 ]** |
| 12   | Ch. 5: Distributed Loads | p. 262–268 class notes | Ch. 5: 66, 68, 70, 76  
**Helpful: 5.78, 81, 83** |
| 13   | 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 |
| 14   | Ch. 9: Parallel Axis Theorem | p. 513 – 519 | Ch. 9: 72, 73, 74 |
| 15   | Final Exam | Dates to be announced by Registrar at a later date. |

**Homework to be assigned by your professor. Homework will be collected randomly per your professor. NO LATE homework can be accepted after the due date.**

**Day Sections** have common hour exams on Mondays, 4:00 -5:25, Oct. 5, Nov. 2, and Nov. 30

**Check for any exam conflicts in advance and make arrangements for make-ups.**
*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 deviation from the syllabus throughout the course of the semester.


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**: Recent 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**: 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, 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:

(a) an ability to apply knowledge of math, science, and engineering
(b) an ability to design and conduct experiments, as well as interpret data
(c) an 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 on 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) an ability to use techniques, skills and modern engineering tools necessary for engineering practice

Rev. 4/4/12, 9/11/13

Course Objectives Matrix; MECH 235 Statics

<table>
<thead>
<tr>
<th>Strategies and Actions</th>
<th>Student Learning Objectives</th>
<th>Student Outcomes (a-k)</th>
<th>Program Educational Objectives</th>
<th>Assessment Methods /Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Objective 1: Provide transition from Physics (science) to Statics (engineering).</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present engineering approach and problem solving techniques used for vector analysis.</td>
<td>Able to apply problem-solving techniques while building on math and physics fundamentals relevant to force systems in equilibrium.</td>
<td>a, e, i</td>
<td>1</td>
<td>Homework, exams and success in future courses.</td>
</tr>
<tr>
<td>Illustrate applications to practical problems of torque, moments, and couples.</td>
<td>Recognize the application of geometry and trigonometry to realistic-type problems. Understand the practical application of cross products and dot products.</td>
<td>a, e, i</td>
<td>1</td>
<td>Homework, bonus problems, and exams.</td>
</tr>
</tbody>
</table>

| **Course Objective 2: Master the concept of two-dimensional and three-dimensional vectors.** | | | | |
| Illustrate 2D vector components by orientation using trigonometry and proportions. | Learn the best approach to determine vector components. Understand when and how to apply trigonometry or proportions in determining vector components. | a, e, i | 1 | Homework and exams. |
| Use vivid Power Point examples to demonstrate analysis technique for force systems on beams and trusses and frames. | Learn the best approach to determine vector components. Understand when and how to apply trigonometry or proportions in determining vector components. | a, e, i | 1 | Homework and exams. |
| Demonstrate logical approach to spatial vectors by visualization of forces, moments. | Able to visualize orientation of spatial components and to develop technique to determine these components using geometry and projections. Understand application of cross products. | a, e, i | 1 | Homework, exams, and bonus challenge problems. |

| **Course Objective 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.** | | | | |
| Require FBD's, for all problems and emphasize importance of vector directions. | Ability to translate a problem statement into a FBD and distinguish tensile and compressive members in trusses and frames. Able to understand the effect of friction in a force system. | a, e, i | 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. | Understand the techniques of problem solving based upon the use of FBD#'s applied to beams, trusses, and frames. Understand the concepts of centroids and moments of inertia. | a, e, i | 1 | Homework, bonus challenge problems, and exams. |
| Provide numerous solved problems available on web. Require numerous homework problems weekly. | Develop the technique of problem solving strategy by repetition for all topics. | a, e | 1 | Homework, exams and bonus challenge problems. |

Rev. 1/6/13, 9/11/13