New Jersey Institute of Technology
Department of Civil & Environmental Engineering

**MECH 236 - Engineering Mechanics: Dynamics** Spring 2018

**Text**:
1. Hibbeler, R.C., Engineering Mechanics-Dynamics, 13th Edition, Prentice Hall, 2010, ISBN 978-0-13-291127-6 or 0-13-291127-2
2. NCEES, Fundamentals of Engineering Supplied-Reference Handbook, 8th Edition, (optional, or print pages free from: http://www.ncees.org/exams/study_materials/fe_handbook/)

**Instructor**: Prof. Henry Fox, P.E., No Office/Hours, email: Henry.E.Fox@njit.edu

*Prerequisite: Mech 235 (or Mech 234 for EE, CoE, IE, ME majors). Provides an understanding of the mathematics of the motion of particles and rigid bodies, and of the relation of forces and motion of particles.*

| WEEK | TOPIC | ARTICLES |
|---|---|---|
| 1 | Kinematics of Particles | 12.1 - 12.6 |
| 2 | Kinematics of Particles | 12.7 - 12.10 |
| 3 | Force & Acceleration | 13.1 - 13.3 |
| 5 | Force & Acceleration | 13.4 - 13.5 |
| 6 | Energy & Work | 14.1 - 14.6 |
| | Mid-Term | |
| 7 | Momentum, Impact | 15.1 - 15.4 |
| 10 | Rigid body: relative velocity | 16.5 |
| 11 | Rigid body: Instant center | 16.6 |
| 13 | Rigid Bodies acceleration | 16.7 |
| 14 | Kinetics of a Rigid Body | 17.1 - 17.5 |
| 15 | Rigid body energy Vibrations | 18.1 - 18.5, 22.1 - 22.2 |
| 16 | Final exam | |

**Homework to be assigned by your professor. Homework will be collected by your professor. NO LATE homework can be accepted.

*Students will be informed in advance by your professor of any modifications or deviation from the syllabus throughout the course of the semester.

**TUTORIAL HELP:**
Tutorial hours will be announced in class. Students with difficulties are encouraged to come during the tutorial hours.

**GRADING:**
The grade will be decided based on the following scheme:

| | |
|---|---|
| Homework/Participation | 30 % |
| Mid-Term Exam | 30% |
| Final Exam | 40% |
| Total | 100% |

**The grade scheduling:**

| | | | | | |
|---|---|---|---|---|---|
| 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.

**SPECIAL NOTES:**
*The University Code on Academic Integrity (NJIT Honor Code) will be upheld in this course.
Any violations will be brought to the immediate attention of the Dean of Students
* Students will be consulted on any substantial changes to the course syllabus.

**Course Policies:**
- Attendance is mandatory
- There will be NO need for mobile telephones during class time.
- Bring your textbook (hard-copy or electronic) to each class meeting.
- Be prepared to participate with class problem solving.
- Bring your calculator.

**Quizzes, Exams and Grading Policies:**
- There will be NO make-up quizzes or exams unless there is documentation provided by the Dean of Students Office to validate your absence.
- I do NOT drop the lowest grade.
- I do NOT curve the grades.
- NO IRRATIONAL NUMBERS ALLOWED FOR ANSWERS. (these counts as an incorrect answer)
- ONLY REAL NUMBERS.

**Homework Policies:**
- Follow the syllabus and do the homework problems outlined.
- Exam problems may be taken from the homework problems, or
  - be very similar to the homework, or
  - Sample Problems in the textbook, or
  - from a completely different textbook.
- Homework will be collected on a weekly basis. ONLY a select few assigned problems will be graded.
- NO late homework will be accepted. NO EXCEPTIONS.
- Homework NOT submitted will earn ZERO points.

- All work must be shown for full credit.
- Textbook IS REQUIRED.
  - You need to obtain a copy of the exact textbook cited (including edition).
  - Homework and examples from the textbook change from edition-to-edition.
  - If you get a different edition of the textbook, and you submit the wrong homework problems, you will receive a ZERO. (*sorry*)
  - P.S. I am aware that a solutions manual is on the web for free.
    - DO NOT USE IT FOR HOMEWORK.
    - Use it for studying for exams.
- You are all entering a Professional Career,
  - Please Respect YOUR work, YOUR Quizzes, YOUR Exams.
  - Please keep work neat and organized.
  - Use grid paper,
    - Print your name on the top of each page
    - Print the Course and Section Number on the top of each page.
    - Staple Your Homework Together. Loose or folded page may be lost. Along with your grade.
  - Yes, I answer emails. However, Emails are not text messages, and do not get an instantaneous response.

## 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

| Strategies and Actions | Student Learning Objectives | Student Outcomes (a-k) | Program Educational Objectives | Assessment Methods /Metrics |
|---|---|---|---|---|
| **Course Objective 1: Provide transition from Physics (science) to Statics (engineering).** | | | | |
| Present engineering approach and problem solving techniques used for vector analysis. | Able to apply problem-solving techniques while building on math and physics fundamentals relevant to force systems in equilibrium. | a, e, i | 1 | Homework, exams and success in future courses. |
| Illustrate applications to practical problems of torque, moments, and couples. | Recognize the application of geometry and trigonometry to realistic-type problems. Understand the practical application of cross products and dot products. | a, e, i | 1 | Homework, bonus problems, and exams. |
| **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, | Able to visualize orientation of spatial components and to develop technique to determine these components using | a, e, i | 1 | Homework, exams, and bonus challenge problems. |

| | | | | |
|---|---|---|---|---|
| moments. | geometry and projections. Understand application of cross products. | | | |
| **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¦#146;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.<br><br>Rev. 1/6/13, 9/11/13 |