SYRACUSE UNIVERSITY
LC SMITH COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

ECS 221 Engineering Mechanics – Statics
Fall 2011

CATALOG DESCRIPTION
Fundamentals of static equilibrium. Vector algebra. Forces, moments, equivalent force systems. Free body diagrams, equilibrium in two and three dimensions. Analysis of structures and machines. Centroids and moments of inertia.

INSTRUCTOR INFORMATION
Prof. Joan V. Dannenhoffer, P.E.
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Office Hours: M//W 3:00 – 4:00; F 12:00 – 1:00, or any time I am in my office, or by appointment

TEACHING ASSISTANT INFORMATION
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154 Link Hall
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TEXTBOOK
Vector Mechanics for Engineers-Statics by F.P. Beer, E.R. Johnston, D.F. Mazurek, and E.R. Eisenberg, McGraw-Hill, 9th Edition, 2010

PREREQUISITES BY TOPIC
To succeed in this course, students should possess the following knowledge and skills, all of which are presented and developed in MAT296 (Calculus II) and PHY211 (General Physics):
- Differential and integral calculus of a single variable
- Introductory treatment of the basic principles of mechanics

COURSE LEARNING OBJECTIVES
This course has five primary objectives:
A) obtain an understanding of vector algebra and develop the skill to use it effectively;
B) acquire the ability to represent and manipulate forces and moments;
C) learn to analyze elementary mechanical systems, including systems with interacting parts;
D) obtain an understanding of dry friction and of elementary structural applications; and
E) understand properties of area and volumes and attain the ability to compute them.

These course objectives satisfy ABET program outcomes *a* and *e*.

COURSE OUTCOMES

At the completion of the course, each student should be able to:

A) (vector algebra)
   1. add, subtract, and multiply vectors by scalars using the parallelogram law
   2. resolve vectors into components
   3. perform basic operations on vectors using rectangular components in two and three dimensions
   4. understand the definitions and properties of the vector and scalar product of two vectors and be able to compute them using rectangular components

B) (forces and moments)
   1. relate forces arising in physical situations to their mathematical representation as vectors
   2. understand the physical meaning of moment of a force about a point and a line and be able to compute these quantities in two and three dimensions
   3. compute moments of couples
   4. resolve forces into forces and moments, and reduce systems of forces

C) (elementary systems)
   1. draw free body diagrams of particles, rigid bodies, and systems
   2. model various connections and supports which arise in mechanical systems
   3. apply Newton's 3rd law to interacting components of a mechanical system
   4. write equilibrium equations in two and three dimensions
   5. solve equilibrium equations and physically interpret solutions

D) (friction)
   1. understand the phenomenological characteristics of dry friction
   2. solve elementary statics problems involving dry friction
   3. recognize simple structures and mechanisms such as trusses, frames, and simple machines
   4. understand particular features common to each class of mechanical system

E) (properties of areas and volumes)
   1. compute centroids and centers of gravity for lines, areas, and solids of revolution by the method of composite bodies and by integration
   2. compute moments of inertia, products of inertia, and polar moments of inertia of areas and solids of revolution by composite bodies and by integration
   3. apply the parallel axis theorem
   4. compute principle axes and principal moments of inertia

COURSE LEARNING OBJECTIVE MEASUREMENT AND ASSESSMENT

Homework	10%
In-class quizzes	10%
Labs	10%
In-class exams (two)	20% each
Comprehensive final exam	30%
Class participation	discretionary

CLASS POLICIES

Academic Integrity Students are expected to comply with their responsibilities as set out in the Syracuse University Student Handbook. Including but not limited to:

- "Students have the responsibility to attend class and know their appropriate academic requirements."
- "Students …are expected to conduct themselves in a manner supportive of the educational mission of the institution. Integrity, respect for the person and property of others … are deemed fundamental to membership in this University community".
- "Plagiarism is the use of someone else's language, ideas, information, or original material without acknowledging the source. Examples of plagiarism: (1) Paper is downloaded from an internet source and/or obtained from a paper mill; (2) paper contains all or part of the writings of another person (including another student), copied without citation; (3) paper contains passages that were cut and pasted from an internet source, **without citation**."
- The Syracuse University Academic Integrity Policy holds students accountable for the integrity of the work they submit. **The policy also governs the integrity of work submitted in exams and assignments as well as the veracity of signatures on attendance sheets and other verifications of participation in class activities. Serious sanctions can result from academic dishonesty of any sort**.

Homework and Lab Assignments

- There is to be no collaboration on quizzes and exams. Students who either give or get help will receive a grade of zero (0) for the quiz or exam.
- The labs and homework assignments are to be done separately by each student. While it is permissible to "discuss" problems with other students, copying solutions will result in a grade of zero (0) for all copied solutions.
- Homework **must be completed on a Statics Worksheet**, multiple pages should be stapled, and homework must always be neat, legible and marked with the students' name and lab section. Your TA has the right to refuse to grade homework not presented appropriately.
- Homework assignment due dates are posted in BlackBoard**. Assignments will be due at 9:30 am in lecture on the due date. No exceptions.** Homework will be returned in lab (recitation).
- **Labs must be completed by 5 pm each Friday**. Attendance and participation in lab is a requirement. You will receive 25% of the lab grade for attending AND participating. If you leave lab early and have not completed all of the assigned problems you will not receive the 25%.

Lecture

- Attendance at lectures is mandatory (There will be quizzes at the beginning of class each day).
- No sleeping, no phones (or other electronic communication devises).
- No laptops (without special arrangement with the instructor)**.**

Exams/Quizzes

- Fully Charged Calculators must be brought to all tests.
- **Any student found cheating on a test or exam will receive a zero for the semester** and other penalties **will** be imposed.

Blackboard

- The syllabus, course calendar, homework assignments, notes and content, and any notices regarding changes to assignments or calendars will all be posted on the course Blackboard website. Students are expected to consult the website frequently.

STUDENTS WITH DISABILITIES

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), http://disabilityservices.syr.edu, located in Room 309 of 804 University Avenue, or call (315) 443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented disabilities Accommodation Authorization Letters, as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Syracuse University and I are committed to your success and to supporting Section 504 of the Rehabilitation Act of 1973. This means that in general no individual who is otherwise qualified shall be excluded from participation in, be denied benefits of, or be subjected to discrimination under any program or activity, solely by reason of having a disability.

You are also welcome to contact me privately to discuss your academic needs although I cannot arrange for disability-related accommodations.

COURSE LEARNING OBJECTIVES

At the completion of the course, each student should be able to:

A. Vector Algebra
1. add and subtract vectors (using the parallelogram law) and multiply vectors by scalars.
2. resolve vectors into components
3. perform basic operations on vectors using rectangular components in two and three dimensions
4. understand and compute the vector and scalar product of two vectors

B. Forces and Moments
1. relate physical forces to their mathematical representation as vectors.
2. understand the physical meaning of moments (about a point or a line) and compute these quantities in two and three dimensions.
3. compute moments of couples
4. resolve forces into forces and moments, and reduce systems of forces

C. Elementary Mechanical Systems
1. draw free body diagrams of particles, rigid bodies and systems
2. model connections and supports
3. apply Newton's 3rd law to a mechanical system
4. write equilibrium equations in two and three dimensions
5. solve equilibrium equations and physically interpret solutions

D. Dry Friction and Elementary Structural Applications
1. understand dry friction
2. solve elementary statics problems involving dry friction
3. recognize simple structures and mechanisms such as trusses, frames and simple machines
4. draw shear and bending moment diagrams

E. Properties of Area and Volume
1. compute centroids and centers of gravity for lines, areas and solids of revolution
2. compute moments of inertia, products of inertia and the polar moments of inertia of areas and solids of revolution
3. apply the parallel axis theorem, compute principle axes and principal moments of inertia.

SCHEDULE

Week	Monday		Wednesday		Friday	
1	8/29	Administrivia (1.1-1.6)	8/31	Vectors & components (2.1-2.8)	9/2	Chapter 2 problems
2	9/5	**No class Labor Day**	9/7	Chapter 2 problems	9/9	Equilibrium of particles (2.9-2.15)
3	9/12	Chapter 2 problems	9/14	Chapter 2 problems	9/16	Equivalent forces (3.1-3.11)
4	9/19	Chapter 3 problems	9/21	Chapter 3 problems	9/23	Moments & couples (3.12-3.20)
5	9/26	Chapter 3 problems	9/28	Chapter 3 problems	9/30	Review
6	10/3	**Exam 1**	10/5	Rigid bodies (4.1-4.4)	10/7	Chapter 4 problems
7	10/10	Chapter 4 problems	10/12	Rigid bodies (4.5-4.9)	10/14	Chapter 4 problems
8	10/17	Chapter 4 problems	10/19	Trusses (6.1-6.8)	10/21	Chapter 6 problems
9	10/24	Frames & machines (6.9-6.12)	10/26	Chapter 6 problems	10/28	Chapter 6 problems
10	10/31	Chapter 6 problems	11/2	Review	11/4	**Exam 2**
11	11/7	Friction (8.1-8.6)	11/9	Chapter 8 problems	11/11	Chapter 8 problems
12	11/14	Chapter 8 problems	11/16	Centroids & CGs (5.1-5.12)	11/18	Chapter 5 problems
13	11/21	**No class Thanksgiving**	11/23	**No class Thanksgiving**	11/25	**No class Thanksgiving**
14	11/28	Moments of inertia (9.1-9.7, 9.11-9.15)	11/30	Chapter 9 problems	12/2	Chapter 9 problems
15	12/5	Chapter 9 problems	12/7	Review	12/9	Wrap-up

The Final Exam is on Friday, December 16, 2011 from 3-5 pm.