American University of Sharjah
College of Engineering
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Fall 2012
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CVE 220: STATICS (3-1-3)

Course Description (Catalogue):

Covers fundamental concepts and principles of mechanics, vectors and force systems; concepts of free-body-diagram; principle of equilibrium of particles and rigid bodies in two and three dimensions; analysis of structures (trusses, frames and machines); shear and bending moment in beams, center of gravity, centroids and area moment of inertia; and friction.

Course Format: Lecture/Recitation.
Prerequisite(s): PHY101 (General Physics I) and PHY101L (General Physics Laboratory).
Lectures: Section 1: Sunday, Tuesday, and Thursday: 8:00 – 8:50 am in EB1-113.
Office Hours: Sunday, Tuesday, and Thursday: 1:00 – 3:00 am or by appointment.
Textbook: Engineering Mechanics - Statics, by R.C. Hibbeler, 12th Edition in SI Units, 2010, Prentice Hall.

Course Objectives:

This course is designed to help the student:

- Develop an understanding of the principles of statics.
- Represent forces and their resultants by scalar and vector approaches.
- Demonstrate an ability to draw free body diagrams for systems.
- Simplify systems of forces and moments to equivalent systems.
- Develop the analytical skills to solve equilibrium problems involving particles and rigid bodies.
- Understand how to determine internal forces within a structural system.
- Understand the laws of dry friction and their applications.
- Determine the properties of areas, volumes, and masses needed in the solution of mechanics problems.

Course Outcomes:

This course requires the student to demonstrate the ability to:

1. Express force in a Cartesian vector form.
2. Find the resultant of a system of forces using both force triangle and component methods.
3. Use the dot product to determine the angle between two vectors or the projection of forces onto various axes.
4. Construct free body diagrams of particles, rigid bodies and structures and identify forces and moments acting on them.
5. Know how to find forces in systems composed of springs, cables and pulleys.
6. Solve particle problems using equations of equilibrium.
7. Determine the moment of a force.
8. Determine equivalent force systems.
9. Solve rigid body equilibrium problems using equation of equilibrium.
10. Determine the forces in truss members using the methods of joints and sections.
11. Use principles of equilibrium to determine forces acting on joints and supports of a frame.
12. Find the internal forces in structures and draw the shear and bending moment diagrams of beams subjected to loads.
13. Solve equilibrium problems of rigid bodies that are subjected to friction.
14. Determine the center of gravity, center of mass, and centroid for a body of arbitrary shape.
15. Determine the moments of inertia of an area about a specified axis.

Topics Covered and Schedule in Weeks:

Basic principles (Chapter 1)	0.5	W1
Force vectors (Chapter 2)	1.5	W2
Equilibrium of a particle (Chapter 3)	1	W3
Force system resultants (Chapter 4)	1.5	W4, W5
Equilibrium of a rigid body (Chapter 5)	1.5	W5, W6
Structural analysis (Chapter 6)	2	W7, W8
Internal forces (Chapter 7)	2	W9, W10
Center of gravity/centroid (Chapter 9)	1.5	W11, W12
Moments of inertia (Chapter 10)	1.5	W12, W13
Friction (Chapter 8)	1	W14
Review	1	W15

Contribution of Course to Meeting Professional Component:

Math and basic science: General education:
Engineering science: 100% Engineering design:

Relationship of Course to Program Outcomes:

This course contributes significantly to the accomplishment of the following program outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering
(e) an ability to identify, formulate, and solve engineering problems

DETAILED COURSE OUTLINE

1. GENERAL PRINCIPLES (Chapter 1 in the Book):

1.1 Engineering Mechanics 1.2 Fundamental Concepts
1.3 Units of Measurements 1.4 International System of Units
1.5 Numerical Calculations

2. FORCE VECTORS (Chapter 2):

2.1 Scalars and Vectors 2.2 Vector Operations
2.3 Vector Addition of Forces 2.4 Addition of System of Coplanar Forces
2.5 Cartesian Vectors 2.6 Addition/Subtraction of Cartesian Vectors
2.7 Position Vectors 2.8 Force vector Directed along a Line
2.9 Dot Product

3. EQUILIBRIUM OF A PARTICLE (Chapter 3):

3.1 Introduction 3.2 Free-Body Diagram
3.3 Coplanar Force Systems 3.4 Three-Dimensional Force Systems

4. FORCE SYSTEM RESULTANTS (Chapter 4):

4.1 Cross Product 4.2 Moment of a Force
4.3 Moment of a Couple 4.4 Reduction of Forces
4.5 Moment of force about a specified axis 4.6 Moment of a couple
4.7 Equivalent system 4.8 Resultant of a force and couple system
4.9 Further reduction of a force & couple system 4.10 Reduction of a simple distributed loading

5. EQUILIBRIUM OF A RIGID BODY (Chapter 5):

5.1 Introduction 5.2 Equilibrium in Two Dimensions
5.3 Equilibrium in 3-Dimensions 5.4 Stability and Determinacy

6. STRUCTURAL ANALYSIS (Chapter 6):

6.1 Analysis of Simple Trusses 6.2 Analysis of Beams

7. INTERNAL FORCES (Chapter 7):

7.1 Internal Forces 7.2 Shear and Moment Diagrams
7.3. Relations between Dist. Load, Shear, and Moment

8. CENTER OF GRAVITY/CENTROID (Sections 9.1-9.3):

8.1 System of Particles 8.2 Center of Gravity/Mass and Centroid

9. MOMENTS OF INERTIA (Sections 10.1-10.5, plus 10.9):

9.1 Moment of Inertia for Areas 9.2 Moment of Inertia by Integration
9.3 Composite Areas

10. FRICTION (Sections 8.1 and 8.2):

8.1 Dry Friction 8.2 Problems Involving Dry Friction

General Policy:

- Attendance is very important; students missing more than 15% of the classes before the drop period will receive a "WF" grade and an "F" thereafter.
- Students are encouraged to ask questions about the simplest thing.
- Exam times are fixed and there will be no makeup exams. If a student misses an exam for a legitimate reason, the subsequent exam grade will be used to compensate for the missed exam. If the student has no legitimate reason, then he/she will receive a grade of zero for that exam.
- All personal electronic devices should be switched off as you enter the class. Students who text, phone or use the internet during the class will be asked to leave. Listening to music or other audio material is not allowed during class, quizzes or exams.
- No students will be admitted to the class 5 minutes after the class starts.
- Sleeping or chatting is not allowed in the class.
- Quizzes may or may not be announced.
- Quizzes, mid-term exams and the final exam are closed book exams. A pencil and scientific calculator are only allowed.

Homeworks:

- Homeworks are very important since they are key to understanding the material and performing well on exams and quizzes; late homeworks will not be accepted.
- All diagrams and graphs shall be drawn by straight edge and properly scaled and labeled. All work must be neat and tangible or it will be returned un-graded with no credit.

Exams:

- There will be two midterm exams; on Tuesday Oct. 23 and on Tuesday Dec. 11, 2012 at 5:00-6:15 p.m. The Final will be on Thursday, January 10, 2013 at 2:00–4:00 p.m.

Academic Integrity:

- Scholastic dishonesty will not be tolerated; students caught cheating on any exam will receive an F for the course, as a minimum.

Grading System:

Homework	10%
Quizzes	15%
Exam 1	20%
Exam 2	20%
Final Exam	35%
Total	100%

Grading Scale:

Grade	Range
A	> 93
A-	90 – 93
B+	86 – 90
B	82 – 86
B-	78 – 82
C+	74 – 78
C	70 – 74
C-	65 – 70
D	55 – 65
F	< 55