CE245
Mechanics
Fall 2013

Instructor:

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CREDITS: (4+1+0) 4 ETCT 6
CLASS TIME: Tues. 13:00-15:00; Th. 13:00-15:00
PRECEPT: Th. 17:00-18:00
LECTURE HALL: Mon. M2171; Th. M3120
OFFICE HOURS: Fr. 10:00-11:00

COURSE (CATALOG) DESCRIPTION:
Concept of modeling and basic principles. Forces, resultants, equivalent systems of forces. Free body diagrams and equilibrium. Virtual work and stability of equilibrium. Internal forces. Analysis of trusses, frames, and beams. Kinematics of particles. Kinetics of particles. Impulse and momentum. Dynamics of rigid bodies. Energy principles.

COURSE OBJECTIVES:
This course is designed to introduce basic principles of statics and dynamics for particles and rigid bodies. The main objective is to help the students develop an intuition for the equilibrium and motion of rigid bodies, and to introduce basic concepts and tools for the analysis of simple structural systems.

TEXTBOOK:
Hibbeler, R.C., "Engineering Mechanics – Principles of Statics & Dynamics", 12th Ed. in SI Units, Prentice Hall.

REFERENCE BOOKS:
Beer & Johnston, "Vector Mechanics for Engineers", McGraw Hill.
Meriam & Kraige , "Engineering Mechanics", Wiley.
Bedford and Fowler, "Engineering Mechanics", Prentice Hall.

CURRICULAR CONTEXT:
This course provides principal knowledge required for further civil engineering courses. Fundamentals of statics and dynamics are given to students by using theories of basic sciences as well as practical engineering exercises. Estimated design content of the course is 20 %.

LABORATORY AND COMPUTER USAGE
N/A

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GRADING POLICIES:
Homeworks and Quizzes: 15 % of the course grade.
Midterm exams: 3 exams. Total 50 % of the course grade.
Final exam: Comprehensive. 35 % of the final grade.

CONTRIBUTION OF THE COURSE TO PROGRAM OUTCOMES:
This course is intended to contribute to the following program outcomes:

- ✓ (a) An ability to apply knowledge of mathematics, science and engineering
- ✓ (c) An ability to design a system, component, or process to meet desired needs
- ✓ (e) An ability to identify, formulate and solve engineering problems
- ✓ (k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice

COURSE ASSESSMENT:
Course will be assessed on the basis of the accomplishments regarding the course objectives and the contributions to the program outcomes. The evaluation will consist mainly of the responses from the students, who will provide their comments to various course related questions in the final week of the semester.

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COURSE OUTLINE:

Week	Topics	Reading Assignment	Objectives
1	Introduction & Force Vectors	Chapter 1 Chapter 2 Chapter 3	General Principles. Mathematical preliminaries. Vector algebra. Forces on a plane, force resultants. Equilibrium of a particle on a plane. Forces in space, equilibrium of a particle in space
2	Force System Resultants	Chapter 4	External and internal forces. Transmissibility and resolution of forces. Vector product and scalar product of two vectors. Moment of a force about a point and an axis, moment of a couple. Equivalent systems of forces, reduction of systems of forces.
3	Equilibrium of Rigid Bodies	Chapter 5	Free body diagrams. Supports and support reactions; connections. Equilibrium of a rigid body in two and three dimensions.
4	Analysis of Structures MIDTERM I	Chapter 6	Analysis of trusses with method of joints and method of sections. Analysis of frames and machines.
5			
6	Center of Gravity and Centroids	Chapter 9	Center of gravity for two-dimensional and three-dimensional bodies. Centroids of lines, areas, and volumes. Composite areas and plates. Distributed loads on beams.
7	Internal Forces	Chapter 7	Internal forces in structural members. Analysis of beams for various types of loading and support conditions. Shear and bending moment diagrams for beams
8	Particle Kinematics	Chapter 12	Motion along a straight path. Displacement, velocity, and acceleration. Description of motion with rectangular, cylindrical, and intrinsic coordinates. Absolute dependent motion. Relative motion with translating axes.
9	Particle Kinetics MIDTERM II	Chapter 13 Chapter 14	Newton's laws of motion. Equation of motion for a particle and for a system of particles. Work and energy. Conservation of energy.
10	Impulse & Momentum	Chapter 15	Impulse & linear momentum of a particle. Extension to a system of particles. Conservation of linear momentum. Impact. Moment of momentum.
11	Planar Kinematics of a Rigid Body	Chapter 16	Translation. Rotation about a fixed axis. General analysis of plane motion. Relative motion analysis. Velocity and acceleration.
12	Planar Kinetics of a Rigid Body	Chapter 17 Chapter 18	Moment of inertia. Equation of motion. Work & energy. Conservation of energy.
13	Impulse & Momentum for Rigid Bodies MIDTERM III	Chapter 19	Linear & angular momentum. Principle of impulse & momentum. Eccentric impact.