

CE 245 MECHANICS

Required course

Fall 2008

Instructor	<i>Name</i>	Nilüfer Özyurt
	<i>Office</i>	
	<i>Hours</i>	M 78, Th 8
Course Data	<i>Hours</i>	MM 56, ThTh 67
	<i>Room</i>	M2152 M2152 M3120 M3120
	<i>Problem</i>	
	<i>Session</i>	F 5, M2231

Course description (Catalog):

CE245 Mechanics

(4+1+0)4

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 and beams. Kinematics of particles. Kinetics of particles. Impulse and momentum. Dynamics of rigid bodies. Energy principles.

Course Objectives (Learning outcomes)

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 equilibrium and motion, and to introduce basic concepts and tools for the analysis of simple structural systems.

Textbook: (available at the bookstore)

Hibbeler, R.C., "*Principles of Statics & Dynamics*" Prentice Hall.

Reference Books:

Various books dealing with statics and/or dynamics are available at the library. See, e.g., the books by Beer & Johnston, Meriam & Kraige, Timoshenko & Young, Shames.

Curricular context:

This required 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 and also useful engineering exercises. Estimated design content of the course is 20 %.

Laboratory and Computer Usage

N/A

Grading Policies:

Quizzes: Two quizzes. 10% of the final grade.

Midterm exams: 2 exams. 60% of the final grade.

Final exam: 30% 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.

Week	Topics	Reading Assignment	Objectives
1	Basic Concepts	Chapter 1 & 2	Mathematical preliminaries.
2	Moments & Force Systems	Chapter 4, Chapter 9	Concept of moment. Moment about a point and an axis. Resolution of forces. Equivalent system of forces. Resultants. Forces acting on a rigid body. Resultants of distributed forces. Center of gravity.
3	Equilibrium QUIZ I		
4	Equilibrium	Chapter 3, Chapter 5	Reaction forces. Equilibrium of a rigid body. Statical Determinacy. Proper and improper constraints.
5	Analysis of Trusses	Chapter 6	Method of joints. Internal forces in a truss. Method of sections. Structures containing multi-force members.
6	Analysis of Beams	Section 7.1-7.3	Forces in beams. Shear and bending moment diagrams. Differential relations. Singularity functions.
7	Virtual Work & Review MIDTERM I	Chapter 11	Principle of Virtual Work. Potential Energy. Stability of Equilibrium.
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 QUIZ 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 MIDTERM II	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	Chapter 19	Linear & angular momentum. Principle of impulse & momentum. Eccentric impact.