AMERICAN UNIVERSITY OF BEIRUT
FACULTY OF ENGINEERING AND ARCHITECTURE

COURSE DESCRIPTION AND SCHEDULE

MECH 230 –Dynamics Spring 2016

Course Instructors: Wajih Najm & Jihad Kasamani

Date	Sections	Materials
		Chapter 12 – Kinematics of a particle 4 Lectures
Jan. 26	12.1	Introduction
Jan. 26	12.2	Rectilinear Kinematics: Continuous Motion
Jan. 28	12.4	General Curvilinear Motion
Jan. 28	12.5	Curvilinear Motion: Rectangular Components
Jan. 28	12.6	Motion of a Projectile
Jan. 28	12.7	Curvilinear Motion: Normal and Tangential Components
Feb. 2	12.8	Curvilinear Motion: Cylindrical Components
Feb. 2	12.9	Absolute Dependent Motion Analysis of Two Particles
Feb. 2	12.10	Relative Motion Analysis of Two Particles Using Translating Axis
Feb. 4		Problems
		Chapter 13 – Kinetics of a Particle: Force and Acceleration 3 Lectures
Feb. 11		Introduction
Feb. 16	13.1	Newton's Laws of Motion
Feb. 16	13.2	The Equation of Motion
Feb. 16	13.3	Equation of Motion for a System of Particles
Feb. 16	13.4	Equation of Motion: Rectangular Coordinates
Feb. 16	13.5	Equation of Motion: Normal and Tangential Coordinates
Feb. 16	13.6	Equation of Motion: Cylindrical Coordinates
Feb. 16	13.7	Central Force Motion
Feb. 18		Problems
		Chapter 14 - Kinetics of a Particle: Work and Energy 3 Lectures
Feb. 23	14.1	The Work of a Force
Feb. 23	14.2	Principle of Work and Energy
Feb. 23	14.3	Principle of Work and Energy for a System of Particles
Feb. 25	14.4	Power and Efficiency
Feb. 25	14.5	Conservative Forces and Potential Energy
Feb. 25	14.6	Conservation of Energy
Mar. 1		Problems
Quiz No. 1		Sat. Mar.5
		Chapter 15 – Kinetics of a Particle: Impulse and Momentum 3 Lectures
Mar. 3	15.1	Principle of Linear Impulse and Momentum
Mar. 3	15.2	Principle of Linear Impulse and Momentum for a System of Particles
Mar. 3	15.3	Conservation of Linear Momentum for a System of Particles
Mar. 3	15.4	Impact
Mar. 8	15.5	Angular Momentum
Mar. 8	15.6	Relation between Moment of a Force and Angular Momentum
Mar. 8	15.7	Angular Impulse and Momentum Principle
Mar. 10		Problems and Review

Date	Sections	Materials
		Chapter 16 – Planar Kinematics of a Rigid Body 4 Lectures
Mar. 15	16.1	Rigid Body Motion
Mar. 15	16.2	Translation
Mar. 15	16.3	Rotation about a Fixed Axis
Mar. 17	16.4	Absolute Plane Motion Analysis
Mar. 17	16.5	Relative Motion Analysis: Velocity
Mar. 17	16.6	Instantaneous Center of Zero Velocity
Mar. 17	16.7	Relative Motion Analysis: Acceleration
Mar. 31	16.8	Relative Motion Analysis Using rotating Axes
Apr. 5		Problems
Quiz No. 2		Sat. Apr. 9
		Chapter 17 – Planar Kinetics of a Rigid Body: Force and Acceleration 3 Lectures
Apr. 7	17.1	Moment of Inertia
Apr. 7	17.2	Planar Kinetics: Equation of Motion
Apr. 7	17.3	Equation of Motion: Translation
Apr. 7	17.4	Equation of Motion: Rotation about a Fixed Axis
Apr. 12	17.5	Equation of Motion: General Plane Motion
Apr. 14		Problems
		Chapter 18 – Planar Kinetics of a Rigid Body: Work and Energy 2Lectures
Apr. 19	18.1	Kinetic Energy
Apr. 19	18.2	The Work of a Force
Apr. 19	18.3	The Work of a Couple
Apr. 19	18.4	Principle of Work and Energy
Apr. 19	18.5	Conservation of Energy
Apr. 21		Problems
		Chapter 19 – Planar Kinetics of a Rigid Body: Impulse and Momentum 2 Lectures
Apr. 26	19.1	Linear and Angular Momentum
Apr. 26	19.2	Principle of Linear Impulse and Momentum
Apr. 26	19.3	Conservation of momentum
Apr. 28		Review and Problems

Textbook: Engineering Mechanics – Dynamics – By: R.C. Hibbeler – 13th. Edition

References: Vector Mechanics – Dynamics - By: Beer and Johnson
Engineering Mechanics – Dynamics – By Meriam
Engineering Mechanics – Statics and Dynamics – By: I.C. Jong & B.G. Rogers

Evaluation: Quiz 1 25% - Quiz 2 25% - Final 40% - Attendance, homework & drop quizzes 10%

Course Description

The course is divided into two parts. The first part covers the Physics of dynamics through kinematics, kinetics, work and energy, and impulse and momentum of particles. The second part applies the basic principles of part one to planar rigid bodies through kinematics, kinetics, work and energy, and impulse and momentum of rigid bodies.

Course Objectives

The course aims at analyzing the condition of motion of bodies under the action of forces, consequently, position, velocity and acceleration of the body can be analyzed or predicted at later instant of time.

Course Outcomes

After completing the course, students will be able to:

- Understand position, velocity, and acceleration of particles and rigid bodies in relation to space and time, and to predict the position, velocity, and acceleration of particles at later instants of time.
- Understand Newton's laws of motion in statics and dynamics, and to predict the motion of bodies at later instants of time.
- Understand mass and gravity.
- Draw free body diagrams and perform kinetic analysis.
- Solve problems by applying conservation of energy with an understanding of the concepts of work and energy.
- Solve problems by applying conservation of momentum with an understanding of the concept of impulse.