UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
MENG-252	Engineering Mechanics: Dynamics	6
Prerequisites	**Department**	**Semester**
MENG-250	Engineering	Fall, Spring, Summer
Type of Course	**Field**	**Language of Instruction**
Elective/Required	Engineering	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	T.B.A	2nd
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-face	N/A	None

Course Objectives:

The main objectives of the course are to:

- Introduce the fundamental principles governing the dynamics of particles and motion of rigid bodies in one, two and three-dimensional spaces.
- Study the motion of objects and the interaction between the forces acting on objects and the induced motion based on a Newtonian formulation of the governing equations.
- Develop an understanding of the physical principles governing rigid body motion and problem solving skills that can be applied to a variety of practical engineering problems.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Use free-body diagrams and apply vector analysis for obtaining relationships between displacement, velocity, and acceleration vectors for a particle, a system of particles and rigid bodies in two- or three-dimensions.
- Apply Newton's second law of motion in determining the dynamic response of a system to applied forces or perform analysis of the motion of a particle, system of particles or a rigid body.
- Apply energy and momentum methods for analyzing the dynamic behavior of mechanical systems.
- Analyze planar as well as three-dimensional kinematics and dynamics of rigid bodies and apply these methods to practical mechanical systems.

Course Content:

- Drawing free-body diagrams
- Motion of a point: position, velocity and acceleration vectors, straight-line and curvilinear motion of a particle
- Force, mass, acceleration, Newton's second law, equation of motion of the center of mass, inertial reference frames
- Work, kinetic energy, work-energy principle, power, work and potential energy, conservation of energy, conservative forces, relationship between force and
- potential energy
- Impulse, momentum, conservation of linear momentum, impacts, angular momentum
- Planar kinematics and dynamics of rigid bodies: types of motion, rotation about a fixed axis, velocities and accelerations in general motion, equations of motion
- Energy and momentum in rigid-body dynamics, principle of work and energy, kinetic energy, work and potential energy, power, principles of impulse and momentum
- Three-dimensional kinematics and dynamics of rigid bodies
- Vibration and time response.

Learning Activities and Teaching Methods:

Lectures, tutorials, in-class examples, discussion

Assessment Methods:

Homework, Mid-term and final exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Engineering Mechanics: Dynamics	A. Bedford W. Fowler	Pearson Ed	2009	9810679408

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Principles of Dynamics	R. C. Hibbeler	Pearson Ed.	2013	9810692943
Vector Mechanics for Engineers: Dynamics	F. P. Beer E. R. Johnston Jr. P. J. Cornwell	McGraw- Hill	2013	9781259007934

Weekly Schedule

Week		Topic
1	Day 1	Free body diagrams of physical problems. Analysis of Motion (vector form of position, velocity and acceleration) and types of motion (straight-line, curvilinear)
	Day 2	Newton's laws (Force, mass, acceleration), equation of motion of the center of mass and inertial reference frames.
2	Day 1	Work, kinetic energy, work-energy principle, power, work and potential energy.
	Day 2	Conservation of energy, conservative forces, relationship between force and potential energy.
3	Day 1	Impulse, momentum, conservation of linear momentum, impacts, angular momentum.
	Day 2	Midterm.
4	Day 1	Planar kinematics and dynamics of rigid bodies (motion, rotation about a fixed axis, velocities and accelerations), equations of motion.

4	Day 2	Energy and momentum in rigid-bodies, principle of work and energy, kinetic energy.
5	Day 1	work and potential energy, power, principles of impulse and momentum.
	Day 2	Planar kinematics and dynamics of rigid bodies (motion, rotation about a fixed axis, velocities and accelerations), equations of motion.
6	Day 1	Three-dimensional kinematics and dynamics of rigid bodies. Vibration and time response.
	Day 2	Final examination.