UNIVERSITY of NICOSIA

Course Code	Course Title	ECTS Credits
MENG-340	System Dynamics and Vibrations	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MENG-252
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	3rd or 4th	Dr Eftychios Christoforou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Introduce basic concepts of vibrational analysis, considering both single and multi-degree-of-freedom systems.
- Develop an understanding of free and forced vibration, natural frequency, mode shape, and damping.
- Analyze vibration problems by formulating and solving the differential equations of single degree-of-freedom systems. Understand and interpret transient response.
- Apply modal analysis and synthesis to multiple degree-of-freedom systems using matrix formulations.
- Apply acquired knowledge to vibration design problems.

Learning Outcomes:

After completion of the course students are expected to:

- Understand the problem and the importance of mechanical vibrations in practical applications.
- Become proficient in the modeling and analysis of one degree-of-freedom systems, free vibrations, transient and steady-state forced vibrations. Linearize nonlinear systems in order to allow a linear vibrational analysis.
- Become familiar with the modeling and analysis of multi degree-of-freedom systems and matrix formulation of the problems.
- Apply Lagrange's equations for modeling mechanical systems.
- Compute the natural frequencies of vibratory systems and determine the system's modal response. Determine the overall response based upon the initial conditions and forcing input.
- Design passive absorbers for practical vibration problems and study vibration transmission.

Course Contents:

- Introduction to mechanical vibration.
- Models with one degree-of-freedom.
- Free response with a single degree-of-freedom.
- Harmonic response with a single degree-of-freedom.
- General forced response.
- Two degree-of-freedom systems.
- Vibration suppression and control.
- Matrix methods for multi degree-of-freedom systems.
- Vibration of distributed systems.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises.

Assessment Methods:

Homework, exams, final exam.

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
William J. Palm III	Mechanical Vibration	John Wiley	2006	0471345555

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Daniel J. Inman	Engineering Vibrations	Pearson	2013	0273768441
Benson H. Tongue	Principles of Vibration	Oxford University Press	2012	0198087357