CES510 - Advanced Structural Dynamics

Course Title	Advanced Structural Dynamics				
Course Code	CES510				
Course Type	Compulsory				
Level	MSc (Level 2)				
Year / Semester	1st Year / 1st Semester				
Teacher's Name	Dr. Panagiotis Papadopoulos				
ECTS	7	Lectures / week	3	Laboratories / week	NA
Course Purpose and Objectives	Use of Structural Dynamics as applied in Civil Engineering. 1. Dynamics Concepts and Methods 2. Applications				
Learning Outcomes	1. Knowledge of the underlying basic dynamic concepts of vibration of discretized and continuum systems. 2. Ability to implement general dynamic analysis, response spectrum and non-linear analysis in the design of structures and their components. 3. Evaluation of current methods of dynamics, know their advantages and limitations.				
Prerequisites		Co-requisites			
Course Content	1. Single Degree of Freedom Systems, natural frequency, damping ratio, free response, impulse response, logarithmic decrement for evaluating damping. 2. Response to Harmonic Loading, resonance, frequency response function, dynamic amplification factor, transmissibility, sensors, 3. Response to Impulsive Transient Loading, impulse and step response, convolution in time and frequency, shock spectra. 4. Application to SDOF Systems, Base Isolation, and Soil-Structure Interaction, Foundations for Vibrating Machinery. 5. Two Degree of Freedom System, tuned mass dampers; 6. Multiple Degree of Freedom Systems. matrix assembly; general eigen-value problem; mode shapes, orthogonality property, diagonalisation, modal superposition 7. Response Spectrum Method for Earthquake Response and application to earthquake Engineering 8. Non-Linear Systems 9. Vibrations of Continuous systems				
Teaching Methodology	The course will be presented through lectures in class. The aim of lectures is to lay down the concepts, explain to students their importance in practical				

	applications, to analyse key theoretical principles and allow for questions related to issues that may come up during the presentation. The learning process is enhanced through practical design examples. Exercises are given to students to solve as homework assignments. Those will not be necessarily part of their assessment. Although the course material (notes presentations etc. are available, students are strongly encouraged to read the subject textbook as well as to perform their own research on particular aspects or practical applications and problems
Bibliography	**Textbooks** 1. "Dynamics of structures: Theory and Applications to Earthquake Engineering", Anil K. Chopra, Pearson; 5 edition, August 18, 2016; 2. "Advanced Structural Dynamics", Eduardo Kausel, Cambridge University Press, 2017. **References** "Structural dynamics", Joseph W. Tedesco, William G. McDougal, C. Allen Ross, Addison Wesley Longman, 1999.
Assessment	The course is assessed through mid-term examinations, assignment and a final examination. The criteria for assessment can be found on the individual assignments and exams. The weights of the course assessment are as follows: Midterm Exam: 30% Assignment: 20% Final Exam: 50%
Language	English