



## Course Syllabus

<b>Course Code</b>	<b>Course Title</b>	<b>ECTS Credits</b>
CEE-321	Structural Dynamics	6
<b>Prerequisites</b>	<b>Department</b>	<b>Semester</b>
MATH-330, CEE-320	Engineering	Fall/Spring
<b>Type of Course</b>	<b>Field</b>	<b>Language of Instruction</b>
Required	Civil & Environmental Engineering	English
<b>Level of Course</b>	<b>Lecturer(s)</b>	<b>Year of Study</b>
1 <sup>st</sup> Cycle	Dr Panayiotis Polycarpou	3 <sup>rd</sup>
<b>Mode of Delivery</b>	<b>Work Placement</b>	<b>Corequisites</b>
Face-to-face	N/A	None

### Course Objectives:

The main objectives of the course are to:

- Develop an understanding regarding the response of structures under dynamic loading, emphasizing on seismic actions.
- Provide the fundamental knowledge in the field of earthquake engineering.
- Introduce the methods for analytical and numerical formulation of typical structural dynamic problems.

### Learning Outcomes:

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

- Identify the dynamic degrees of freedom of a system and distinguish them from static degrees of freedom;
- Describe the meanings of free vibration, eigen-frequency, forced vibration and damping;
- Formulate the equation(s) of motion of a given dynamic system under various types of dynamic load;
- Compute the dynamic properties for a given SDOF system and evaluate its dynamic response in both analytical and numerical manner;
- Construct the mass, stiffness and damping matrices of a MDOF system;
- Implement the basic methods of evaluating the dynamic response of MDOF systems;
- Perform response spectrum analysis for a given MDOF system;

- Explain the differences between modal time-history analysis, direct-integration method and response spectrum analysis.

**Course Content:**

- Single degree of freedom (SDOF) systems: Dynamic loading, Inertia forces, Dynamic degrees of freedom, Equation of motion, Free vibration, Damping, Harmonic and periodic excitations of without and with damping, the various methods for the analytical and numerical evaluation of the dynamic response, seismic excitations, response spectrum.
- Multi degree of freedom (MDOF) systems: Equations of motion, Mass and stiffness matrices, the single-story building, Free vibration, Natural frequencies and mode shapes, Rayleigh damping matrix, Forced vibration, base excitations, evaluation of the response of MDOF systems: modal analysis, response spectrum analysis, direct integration methods.

**Learning Activities and Teaching Methods:**

Lectures, in-class examples and exercises

**Assessment Methods:**

Homework assignments, mid-term exam(s), final exam (comprehensive).

**Required Textbooks / Readings:**

Title	Author(s)	Publisher	Year	ISBN
Dynamics of Structures, 5th Edition (SI version)	Anil K. Chopra	Pearson	2020	978-1-292249209 (e-book)

**Recommended Textbooks / Readings:**

Title	Author(s)	Publisher	Year	ISBN
Basic Structural Dynamics	Anderson, James C. & Naeim, Farzad	Wiley	2012	9781118279113 (E-Book)

Dynamics of structures, 2nd edition	Ray W. Clough and Joseph Penzien	McGraw-Hill	1993	0-07-011394-7
Structural Dynamics: Theory and Computation (5 <sup>th</sup> Ed.)	Mario Paz and William Leigh	Springer	2013	978-1461350989