



<b>Course Code</b> CVEE-422	<b>Course Title</b> Computer-Aided Structural Analysis and Design	<b>ECTS Credits</b> 6
<b>Department</b> Engineering	<b>Semester</b> Fall, Spring	<b>Prerequisites</b> CVEE-320
<b>Type of Course</b> Elective	<b>Field</b> Civil & Environmental Engineering	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Year of Study</b> 4 <sup>th</sup>	<b>Lecturer(s)</b> Dr Panayiotis Polycarpou
<b>Mode of Delivery</b> Face-to-face	<b>Work Placement</b> N/A	<b>Co-requisites</b> None

### **Objectives of the Course:**

The main objectives of the course are to:

1. Teach how to use structural analysis software for the static and dynamic analysis of structures.
2. Explain how the various structural analysis software applications work.
3. Explain how to assess and validate the computed results and how these are related to the modelling assumptions

### **Learning Outcomes:**

After completion of the course students are expected to:

- Build the mathematical model of a given physical structure
- Formulate and use each one of the various types of finite elements
- Identify and explain all steps involved in the Direct Stiffness Method
- Model a simple building, using a commercial analysis software and analyse it for both static and seismic actions
- Perform structural design of the simulated structure, according to the code requirements

**Course Contents:**

**Introduction:** basic theory of the Finite Element Method, overview of the Direct Stiffness Method and its application in the analysis of trusses and framed structures

**Modelling principles:** Types of finite elements and their degrees of freedom, truss, beam, plane stress, plane strain, shell, solid elements, selection of appropriate elements for the various types of structures

**Frame structures modelling:** Beams, columns, stairs, plates and shells, shear walls, supports, diaphragms, masses, dynamic degrees of freedom.

**Programming:** implementation of the direct stiffness method in MATLAB code, development of a simple algorithm to perform dynamic analysis of simple multi-degree of freedom systems

**Finite Element Analysis Software:** Capabilities, uses, advantages and limitations of structural engineering computer software, modelling a simple building, performance of static analysis, response spectrum analysis, direct integration dynamic analysis, non-linear analysis, post-processing of the results, combinations, design according to the European standards (Eurocodes)

**Learning Activities and Teaching Methods:**

Lectures, examples and exercises in computer lab, homework assignments

**Assessment Methods:**

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

**Required Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
S.M. Holzer	Computer Analysis of Structures: Matrix Structural Analysis Structured Programming	Elsevier Science	1985	978-0444009432

**Recommended Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
Bathe K.J.	Finite Element Procedures	Prentice Hall	2007	978-0979004902