



Course Syllabus

Course Code	Course Title	ECTS Credits
CEE-422	Computer-Aided Structural Analysis and Design	5
Prerequisites	Department	Semester
CEE-321	Engineering	Fall, Spring
Type of Course	Field	Language of Instruction
Elective	Civil & Environmental Engineering	English
Level of Course	Lecturer(s)	Year of Study
1 st Cycle	Dr Loizos Papaloizou	4 th
Mode of Delivery	Work Placement	Corequisites
Face-to-face	N/A	None

Course Objectives:

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. Familiarize students on 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 be able 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.
- Demonstrate the concepts of energy performance certification of buildings.

Course Content:

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, computer projects, mid-term exam, final exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Matrix Analysis of Structures	Aslam Kassimali	Cengage Learning; 2 edition	2011	978-1111426200

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Finite Element Procedures	Bathe K.J.	Prentice Hall	2007	978-0979004902
Computer Analysis of Structures: Matrix Structural Analysis Structured Programming	S.M. Holzer	Elsevier Science	1985	978-0444009432