



Course Syllabus

Course Code CEE-421	Course Title Finite Element Structural Analysis	ECTS Credits 5
Prerequisites CEE-320, ENGR-290	Department Engineering	Semester Fall/Spring
Type of Course Elective	Field Civil & Environmental Engineering	Language of Instruction English
Level of Course 1 st Cycle	Lecturer(s) Dr Loizos Papaloizou	Year of Study 4 th
Mode of Delivery Face-to-face	Work Placement N/A	Corequisites None

Course Objectives:

The main objectives of the course are to:

- Understand the fundamental principles underlying the Finite Element Method.
- Gain insight into appropriate use of Finite Element Modelling.
- Familiarize the students with a Finite Element Software to solve practical problems.

Learning Outcomes:

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

- Identify and explain all steps involved in the Finite Element Analysis.
- Formulate finite element approximations to partial differential equations.
- Choose appropriate elements for a variety of applications.
- Identify sources of errors in finite element computations.
- Perform calculations after applying the stiffness method.
- Perform modelling of trusses, beams, frames, plates and shells with a finite element software.
- Use a finite element software for solving practical civil engineering problems.
- Solve numerically problems of structural mechanics and dynamics with finite elements.

Course Content:

- Introduction to the finite element method.
- Approximation techniques and variational formulation.
- The stiffness method. Mathematical interpretation of finite elements, shape functions, formulation of the stiffness matrix, treatment of boundary conditions
- Isoparametric finite elements.
- Truss structures.
- Beam and frame structures.
- Plates and Shells
- Meshing
- Symmetry – Antisymmetry
- Accuracy (Comparison with analytical solutions for classical problems)
- Elasticity problems.
- Dynamics and Vibrations problems.

Learning Activities and Teaching Methods:

Lectures, Projects, Experiments, in-class assignments, discussion.

Assessment Methods:

Homework, Project, mid-term exam, final exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
The Finite Element Method: A Practical Course	Liu G.R. and S.S Quek	Elsevier (2 nd Edition)	2013	9780080994413

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
An Introduction to the Finite Element Method	Reddy J.N	Mc Graw Hill (3 rd Edition)	2005	0072466855
Finite Element Procedures in Engineering Analysis	Bathe K-J	Prentice-Hall (2 nd Edition)	2014	978-0-9790049-5-7