UNIVERSITY *of* NICOSIA

Course Code	Course Title	ECTS Credits
CVEE-421	Finite Element Structural Analysis	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	ECE-290, CVEE-320
Type of Course	**Field**	**Language of Instruction**
Elective	Civil & Environmental Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	4th	Dr Panayiotis Polycarpou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are:
1. Understand the fundamental principles underlying the Finite Element Method
2. Gain insight into appropriate use of Finite Element Modelling.

Learning Outcomes:

After completion of the course students are expected 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

Course Contents:

Introduction: Type of structures, basic concepts of structural modelling, physical model, mathematical model, General description of the Finite Element Method (FEM), types of finite elements, general applications of the method.

FEM Formulation: Basic principles of continuum mechanics, potential energy approach, Galerkin method, displacements (direct stiffness) method, mathematical interpretation of finite elements, shape functions, formulation of the stiffness matrix, treatment of boundary conditions.

Element properties: Rod element, beam element, Plane finite elements, Three dimensional (3D) and axisymmetric finite elements. Isoparametric elements,

Implementation & analysis: solving simple trusses and frame structures using the FEM, numerical integration, convergence requirements, 2D and 3D FEA problems,

meshing, FEM in dynamics.

Accuracy: Comparison with analytical solutions for classical problems, Error sources identification and discussion of treatment methods, limitations, singularity issues.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises, Homework assignments

Assessment Methods:

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

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
R.D. Cook, D.S. Malkus, M.E. Plesha, R. J. Witt	Concepts and Applications of Finite Element Analysis	Wiley	2001	978-0471356059

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
O. C. Zienkiewicz, R.L. Taylor, J.Z. Zhu	The Finite Element Method: Its Basis and Fundamentals (6th ed.)	Butterworth-Heinemann	2005	978-0750663205
Bathe K.J.	Finite Element Procedures	Prentice Hall	2007	978-0979004902
Chandrupatla, T. R., Belegundu, A.D	Introduction to Finite Elements in Engineering	Prentice Hall	1991	0-13-483082-2