CVX7344 Computational Mechanics using Finite Element Methods

Level	7
Course Code	CVX7344
Course Title	Computational Mechanics using Finite Element Methods
Credit value	3
Core/Optional	Elective (Civil Engineering)
Course Aim/s	To teach finite element based structural analysis
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Describe numerical methods in structural analysis; Introduce the steps of finite element methods; Formulate potential energy function and basis of finite element methods. [Uni-structural] CLO2: Describe bar element; Formulate element stiffness matrix; Develop global stiffness matrix; Apply constitutive relationships; Perform truss analysis application using finite element method.[Relational] CLO3: Describe beam element; Formulate element stiffness matrix; Develop global stiffness matrix; Apply constitutive relationships; Perform frame analysis using finite element method.[Relational] CLO4: Extend finite element analysis to plain stress/strain problems; Describe constant strain triangle , four node element; Formulate shape function; Apply strain-displacement relationships; Perform plain stress analysis using finite element method. [Multi structural] CLO5: Describe material idealization, Describe numerical methods in matrix solution. [Uni-structural] CLO6: Use computer analysis for complex two dimensional and three dimensional problems. [Multi-structural]
Content (Main topics, sub topics)	**Outline Syllabus:** Unit 1: Introduction and 2D problems Session 01:Numerical Methods in Structural Analysis I Session 02:Numerical Methods in Structural Analysis II Session 03:Fundamentals of Finite Element Methods I Session 04:Fundamentals of Finite Element Methods II Session 05:Bar Element Session 06:Beam Element Session 07:Plane Stress Problems Session 08:Plane Strain Problems Unit 2: Advanced Topics in Finite Element Methods Session 09:Material Modeling I Session 10:Material Modeling II Session 11:Non-linear and Dynamic Loading Session 12:Applications with Commercial Programs I Session 13:Applications with Commercial Programs II Session 14:Applications with Commercial Programs III Session 15:Finite Difference Method **Laboratory work:** 1. Prepare numerical models using available computer softwares and perform analysis for following cases a. Pin jointed truss b. Frame Structure c. Continuous beam problem d. 2D grid plate structure e. 3D complex structure 2. Perform Numerical model on nonlinear dynamic problem using program source code writing and solving.