Course Syllabi: UCE611 Finite Element Methods in Engineering Analysis (L : T : P :: 3 : 1 : 0)

1. **Course number and name:** UCE611; Finite Element Methods in Engineering Analysis

2. **Credits and contact hours:** Credits: 3.5; Hours: 4

3. **Text book, title, author, and year**

   - *Bhavikati S. S., "Finite Element Analysis" New Age International Publishers, New Delhi (2005).*
   - *Desai C. S. and Abel J. F.; Introduction to The Finite Element Method: a Numerical Method for Engineering Analysis, CBS Publisher (2005).*
   - *Gallagher, R. H., Finite Element Analysis: Fundamentals, Prentice Hall, Englewood Cliffs (1987).*
   - *O.C. Zienkiewicz&R.L.Taylor, "The Finite element method", Butterworth Heinemann (Vol I and Vol II), (2000).*
   - *J. N. Reddy, An introduction to the finite element method, McGraw Hill Inc. (1993).*
   - *C.S. Krishnamoorthy, "Finite Element Analysis, Theory and programming", Tata McGraw Hill, (1994).*
   - *K.J. Bathe, "Finite Element Procedures in Engg. Analysis", Prentice Hall of India, (1996)*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Introduction to Finite Elements: Introduction, Direct formulation of finite element characteristics, Energy approach, Convergence criteria, Displacement functions with discontinuity between elements, Solution bounds, Extension of variational approach.

   Plane Stress and Plane Strain: Introduction, Element characteristics, Assessment of accuracy, Some practical applications.

   Axis-Symmetric Stress Analysis: Introduction, Element characteristics, Practical applications, Non-symmetrical loading.

   Some Improved Elements in 2–D Problems: Introduction, Quadrilateral element, Characteristics derived from triangular elements, Conforming shape functions for a rectangle, Conforming shape functions for an arbitrary quadrilateral, Triangular element with size nodes.

   Isoparametric Formulation: Coordinate Transformation Isoparametric, Superparametric and Subparametric elements, Assembling Stiffness Matrix, Numerical Integration.

   Applications of Finite Element Analysis: Heat and fluid transfer; Analysis of Beams and Rigid frames.

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:

   - Describe the fundamental ideas of FEM and know the behavior and usage of different elements.
   - Prepare a FEM model for structures.
   - Analyze structure using a software.
   - Interpret and evaluate the results.

6. **Brief list of topics to be covered**
    - Introduction to Finite Elements
    - Plane Stress and Plane Strain
    - Axis-Symmetric Stress Analysis
    - Isoparametric Formulation