4) Gopal Ranjan & ASR Rao, *"Basic and Applied Soil Mechanics"*, 3rd Edition, New Age International Pvt.Ltd, Publishers, 2002.

5) Srinivasulu, P and Vaidyanathan, G.V., *"Handbook of Machine Foundations",* 2nd Edition, Tata McGraw Hill, 1999.

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FINITE ELEMENT METHOD WITH STRUCTURAL APPLICATIONS

Course Code: 13CE 2212 **L P C**
4 0 3

Course Outcomes:
At the end of the course, the student will be able to:
CO1 : Discuss the basics of FEM
CO2 : Explain the shape functions and stiffness matrix
CO3 : Prepare stiffness matrix for 2D elements
CO4 : Describe the use and concepts of iso-parametric elements.
CO5 : Analyse beams, 2D & 3D structural systems.

UNIT- I
Introduction : Concept of Finite Element Method - Merits and demerits, applications, relevant software's. Steps involved in FEM as applicable to structural mechanics problems. Descritization interpolation model, Convergence and compatibility criteria.

UNIT-II
Shape Functions - Methods of Determination
Element Stiffness matrix Equation - Derivation of stiffness matrix based on Principle of minimization of Total Potential Energy and Principle of Virtual Work.
Assemblage of Element Stiffness Matrices – Assembly procedure, solution of nodal displacement, Element Stresses and Strains, Interpretation of results, Post processing, Static condensation.

UNIT- III

2D Analysis using FEM : Stiffness Matrix for a Two noded bar/Truss Element, Three noded Truss Element and Two noded Beam Element in Local, and Global (2D)
Stiffness Matrix for a three noded Constant Strain Triangular (CST) Four noded for Plane Stress and Plane Strain Condition.

UNIT- IV

Isoparametric Formulation: Isoparametric, sub-parametric and super parametric Elements, Procedure for Formulation, Advantages of Isoparametric Elements, Shape functions for Isoparametric Elements, Transformation of axes, Co-ordinate systems in FEM - Jacobian relevance to FEM.

UNIT-V

Application of F.E.M to Structural Mechanics Problems : Analysis of 2D –Truss, Initial Strain/Rise in Temperature, 3D Truss, Analysis of Propped Cantilevers, Fixed beams, Continuous beams and Portal Frames.

TEXT BOOKS

1. Chandrupatla,T.R., Belegunde, A.D,*"Introduction to Finite Elements in Engineering",* 3rd edition, PHI, 2010.

2. S.S. Bhavikatti, *"Finite Element Analysis"* , 2nd edition, New age international, 2010.

REFERENCES

1. Klaus-Jurgen Bathe, *"Finite Element Methods",* 2nd edition, Prentice Hall, 2010

2. Reddy, J.N., *"Introduction to Finite Element Method",* 3rd Edition, Mc Graw Hill, 2002

3. Desai,Y.M., Eldho.TI, Shah,A.H, *"Finite Element methods with application in Engineering",* 1st edition, Pearson, 2011

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