IV Year B.Tech. Automobile Engg. I-Semester	L	T	P	To	C
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AE411 FINITE ELEMENT METHODS (DEPT. ELECTIVE - II)

Objective of the Course:

This course deals with the theory and application of the finite element methods for analyzing structural systems and heat transfer problems.

UNIT - I

Finite Element Analysis : Historical background - weighted residual methods-basic concept of fem - variational formulation of B.V.P.- Ritz method-finite element modeling - element equations - linear and quadratic shape functions - bar, beam elements - applications to heat transfer.

UNIT - II

Finite Element Analysis of 2D Problems : Basic boundary value problems in 2 dimensions-triangular, quadrilateral, higher order elements - poissons and laplace equation - weak formulation - element matrices and vectors-application to solid mechanics, heat transfer, fluid mechanics.

UNIT - III

ISO-Parametric Formulation : Natural co-ordinate systems - lagrangian interpolation polynomials - isoparametric elements – formulation - numerical integration - 1D, 2D, triangular elements - rectangular elements - illustrative examples.

UNIT - IV

Solution to Plane Elasticity Problems : Introduction to theory of elasticity-plane stress-plane strain and axisymmetric formulation principles of virtual work, consistent and lumped formulation-use of local co-ordinates, element matrices using energy approach.

UNIT - V

Special Topics : Dynamic analysis – equation of motion - mass matrices - free vibration analysis - natural frequencies of longitudinal - transverse and torsional vibration - introduction to transient field problem - non linear analysis - use of softwares - h and p elements - special element formulation.

TEXT BOOKS:

1. Chandraputla, Ashok and Belegundu , “Introduction to Finite Elements in Engineering”, 3rd ed., PHI Publishers, 2009.
2. S.S. Rao, “The Finite Element Methods in Engineering”, 4th ed., Pergamon, 2005.

REFERENCE BOOKS:

1. J.N. Reddy, “An introduction to Finite Element Method”, 3rd ed., Mc Graw Hill, 2005.
2. Alavala, “Finite Element Methods”, 2nd ed., PHI, 2008.
3. Kenneth H. Huebner, Donald L. Dewhirst, “The Finite Element Method for Engineers”, 4th ed., John Wiley & Sons (ASIA), 2007.
4. C.S. Krishna Murthy, “Finite Element Analysis”, 2nd ed., Tata MC graw Hill, 2005.