Subject Title: **KJ4364 Finite Element Method**

Subject Summary:

Fundamental Concepts, 1-Dimensional Problems, 2-Dimensional Problems including Axisymmetric problems Isoparametric elements and numerical integration, Beams and Frames, 3-Dimensional Problems, Scalar Field Problems, Dynamic consideration, Design and analysis project using finite element packages.

References:

Chandrupatla, T.R. & Belegundu, A.D., *Introduction to Finite Elements in Engineering*, 3nd ed., Prentice Hall International, 2002.

Zienkiewicz, O.C. & Taylor, R.L. *The Finite Element Methods*, Elsevier, New York, 2005.

Cook, R.D., Malkus D.S. & Plesha, M.E., *Concepts and Applications of Finite Element Analysis,* 3rd ed., John Wiley & Sons, New York, 1989.

Buchanan, G.R., Theory and Problems of Finite Element Analysis, Schaum's Outline Series, Mc Graw Hill, New York, 1995.

Huebner, K.H., Thornton, E.A. & Byrom, T.G., The Finite Element Method for Engineers, 3rd ed., John Wiley & Sons, New York, 1995.

Subject Detail/Planning:

1. Fundamental Concepts
   Introduction and historical background, element shape and terminology, stresses and equilibrium, boundary conditions, Direct and mathematical approach, Rayleigh-Ritz and Galerkin's method, von-Mises stress, matrix Algebra application and Gaussian elimination.

2. 1-Dimensional Problems
   Finite element modeling, linear shape function, potential energy approach, Galerkin approach, assembly of the stiffness matrix and finite element formulation, quadratic shape function, trusses problems (2-D and 3-D) using 1-D principles.

3. 2-Dimensional Problems
   Finite element modeling using constant strain triangles (linear shape function), modeling and boundary conditions. Axisymmetric problems. Isoparametric elements and numerical integration. Higher order elements.

4. Beams and Frames
   Finite element formulation, load vector and boundary considerations, shear force and bending moment. 2-D and 3-D frames.

5. 3-Dimensional Problems
   Finite element formulation, stress calculations, mesh preparation, problem modeling.

6. Scalar Field Problems
   Steady state heat transfer, torsion, flow, electric and magnetic.

7. Dynamic consideration
   Finite element formulation, element mass matrices, evaluation of eigenvalues and eigenvectors using iteration and Jacobi method.

Computer Laboratory:

Introduction to commercial and in-house finite element packages.

Assessment:

Assessment	Percentage (%)	Learning contribution	
Final examination	30-50	Lecture:	2.0
Mini project	20-30	Computer lab:	1.0
Continuous tutorial assessment	40-60		
Total	**100**		3.00