COURSE NUMBER: Vm305	**COURSE TITLE:** Introduction to Finite Elements in Mechanical Engineering
TERMS OFFERED: Summer	**PREREQUISITES:** Vm211
TEXTBOOKS/REQUIRED MATERIAL: Course Pack	**INSTRUCTOR:** Wei Lu **DATE OF PREPARATION:** May 23, 2012 **DATE OF UC APPROVAL:**
INSTRUCTOR(S): Wei Lu	**SCIENCE/DESIGN:** n/a
CATALOG DESCRIPTION: Introduction to theory and practice of the finite element method. One-dimensional, two-dimensional, and three dimensional elements are studied, including structural elements. Primary fields of applications are strength of materials (deformation and stress analysis) and dynamics and vibrations. Extensive use of commercial finite element software packages, through computer labs and graded assignments.	**COURSE TOPICS:** 1. Anatomy of Finite Element Analysis 2. Uniaxial rod element: rod stiffness matrix 3. Finite element assembly process 4. Finite element solution techniques 5. Truss elements 6. Beam/Frame elements 7. Plate/shell elements 8. Structural analysis 9. Selected analysis types: heat conduction, modal analysis, buckling analysis 10. Introduction to design optimization using finite elements 11. Use and application of commercial finite element software
COURSE STRUCTURE/SCHEDULE: Lecture: twice per week, 90 minutes each; Laboratory: 1 per week, 90 minutes	

COURSE OBJECTIVES [Course Outcomes in brackets]	1. To teach students how to model and analyze mechanical systems using finite element analysis [1, 2, 3, 5] 2. To teach students the underlying concepts of finite element analysis and finite element software [1 ,2, 6] 3. To teach students the basic skills in using commercial finite element software and effective presentation of their analysis results [1, 3, 4, 5, 6] 4. To reinforce students' understanding of engineering through the analysis of real-world problems [3, 4, 5, 6]
COURSE OUTCOMES [Program Outcomes in brackets]	After completing Vm305, students should be able to: 1. Given a structural engineering problem, identify the necessary information required to conduct a structural analysis using finite element software [a, c, e, g, k, l] 2. Assess the quality of finite element models of mechanical systems [a, c, e, k, l] 3. Use finite element software to develop models of mechanical systems [a, c, e, k, l] 4. Interpret the solutions obtained from finite element analyses [a, g, k, l] 5. Using finite element software, conduct structural analyses and selected other analysis classes, e.g., normal modes/natural frequency analysis, steady-state heat conduction analysis, buckling analysis, design optimization [a, c, e, k, l] 6. Recommend finite element software based upon company/client needs [a, g, k, l]
ASSESSMENT TOOLS [Course Outcomes in brackets]	1. Regular homework problems [1, 2, 3, 4, 5, 6] 2. Exams [1, 2, 3, 4, 5]