1. Course number and name  
   **EML 4536 Design Using FEM (Finite Element Method)**

2. Credits and contact hours  
   3 cr, 2.5 contact hours (2 hrs. 30 min. lecture)

3. Instructor’s or course coordinator’s name  
   Instructor: Dr. William S. Oates, Coordinator: Dr. William Oates

4. Text book, title, author, and year  
   An Introduction to the Finite Element Method, Reddy, J. N., 2005

5. Specific course information  
   a. *brief description of the content of the course (catalog description)*  
   This course introduces the fundamentals of finite element analysis for solving  
   boundary value problems for a broad class of engineering problems. The course  
   includes a theoretical foundation and application of finite element numerical methods.  
   Hands-on experience with commercial finite element software and practical aspects  
   of many mechanical engineering problems will be included.
   
   b. *prerequisites or corequisites*  
   Prerequisite: An understanding of calculus and linear algebra is required.
   
   c. *indicate whether a required, elective, or selected elective course in the program*  
   Selected Technical Elective course

6. Specific goals for the course  
   a. *Course Outcomes*  
   1. The strong and weak formulation used to define a number of governing equations  
      encountered in engineer mechanics, heat transfer, fluid dynamics, and electromagnetics  
   2. How to apply boundary conditions to model mechanical, thermal, fluid and multi-physics behavior  
   3. Numerical implementation of the finite elements equations using interpolation  
      functions  
   4. Assembly of finite element equations for 1D and 2D problems  
   5. Solution methods and convergence criteria  
   6. The application of a finite element software package
   
   b. *Course Objectives and Relation to Student Outcomes*  
   1. Develop creativity and intellectual curiosity in graduates  
   2. Understand and apply mathematics and physics to reason scientifically and solve quantitative problems  
   3. Use the engineering design process by which mathematical and scientific facts  
      and principles are applied  
   4. Communicate in precise language, correct sentences, and concise, coherent  
      paragraphs--each communication evincing clear, critical thinking  
   5. Demonstrate commitment to progressive and continued educational development

7. Brief list of topics to be covered  
   • Introduction to the finite element method  
   • Second order 1D finite element problems and applications  
   • Beams  
   • Eigenvalue and time dependent problems  
   • Computational methodology

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• Scalar problems in 2D
• Detail numerical considerations
• Incompressible flows
• Plane elasticity