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 electro-magnetics
      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

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