Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

1. This request is submitted by the Department of Mechanical Engineering

2. Course prefix, number and complete title of course: MEEN 672: Introduction to the Finite Element Method

3. Course description (not to exceed 50 words): Weak or variational formulation of differential equations governing one-and-two dimensional problems or engineering; finite element model development and analysis of standard problems of solid mechanics (bars, beams, and plane elasticity); heat transfer and fluid mechanics; time-dependent problems; computer implementation and use of simple finite element codes in solving engineering problems.

4. Prerequisite(s): Senior or Graduate Classification

Cross-listed with: ____________________________________________________________________________

Cross-listed courses require the signature of both department heads.

5. Is this a variable credit course? □ Yes  ❌ No If yes, from _______ to _______

6. Is this a repeatable course? □ Yes  ❌ No If yes, this course may be taken _______ times. Will this course be repeated within the same semester? □ Yes  ❌ No

7. Has this course been taught as a 489/689? □ Yes  ❌ No If yes, how many times? 1

Indicate the number of students enrolled for each academic period it was taught. 40, Spring 2007

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   _______________________________________________________________________________________

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

   _______________________________________________________________________________________

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

10. Prefix  Course #  Title (excluding punctuation)
    MEEN  672  INTRO FINITE ELEMENTS

    Lect.  Lab  SCH  CIP and Fund Code  Admin. Unit  Acad. Year  FICE Code
    0 3 0 0 0 3 1 4 1 9 0 1 0 0 6 1 9 2 0 10-11 0 0 3 6 3 2

Approval recommended by:

Head of Department  Date
Head of Department (if cross-listed course)  Date

Submitted to Coordinating Board by:

Associate Director, Curricular Services  Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 10/08
MEEN 672  Introduction to the Finite Element Method

COURSE DESCRIPTION: Weak formulation of differential equations arising in one- and two-dimensional heat transfer, fluid mechanics, and solid and structural mechanics; finite element model development and analysis of problems from various fields of engineering and applied sciences (e.g., 1-D heat transfer and fluid mechanics, bars, beams, 2-D field problems, plane elasticity and 2-D viscous flows); eigenvalue and time-dependent problems; finite element implementation and use of simple finite element codes from the book.


INSTRUCTOR: J. N. Reddy, Distinguished Professor of Mechanical Engineering
Room 210 Engineering Physics Building (ENPH), Office Wing (979) 862 2417, jnreddy@tamu.edu

GOALS: The goals of the course include:

1. Understand the theory of the finite element method as applied to representative problems of heat transfer, fluid mechanics, and solid mechanics.
2. Able to solve simple problems of heat transfer, fluid mechanics, and solid mechanics using the finite element method
3. Able to write computer programs to implement the finite element analysis steps for typical 1-D and 2-D problems of engineering; application of educational programs to solve typical problems of engineering and applied science.

PREREQUISITES: The students of the course must have a background in differential equations and exposure to the field equations of engineering (i.e., an undergraduate degree in engineering or applied sciences is required). The participants of the course are not required to have a prior knowledge of the theory of the finite element method.

TOPICS:
Week 1: Introduction to weak-form formulations and variational methods.
Week 2: Introduction to the finite element method as applied to one-dimensional problems. Theoretical formulation of 1-D heat transfer and deformation of bars.
Week 3: Numerical solution of problems of heat transfer, fluid mechanics, and axial deformation of bars. Illustration of assembly, imposition of boundary conditions, and solution of equations.
Week 4: Finite element models of Euler-Bernoulli beams and Timoshenko beams.
Week 5: Numerical analysis of beams; plane frame structures. Test 1
Week 6: Computer implementation of one-dimensional problems
Week 7: Finite element models of 2-D field problems with application to heat transfer problems.
Week 8: Numerical examples of heat transfer, fluid mechanics (stream function and velocity potential), and solid mechanics (torsion) problems.
Week 9: Finite element formulations of time-dependent problems.
Week 10: Computer implementation of two-dimensional problems
Week 11: Finite element models of eigenvalue problems as applied to buckling and vibration.
Week 12: Review of 2-D finite element models and Test 2
Week 13: Finite element models of elasticity problems
Week 14: Finite element models of viscous fluid flow problems
Final Examination

GRADING
Home-work: 15%
Test 1: 25%
Test 2: 25%
Final Exam: 35%

A: 90-100; B: 80-89; C: 70-79; D: 60-69, F: below 60
Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity

For additional information please visit: http://www.tamu.edu/aggiehonor

"An Aggie does not lie, cheat, or steal, or tolerate those who do."