The University of Texas at Tyler
Master of Science in Mechanical Engineering

MENG 5326 – Finite Element Methods in Mechanical Engineering

Syllabus

Catalog Description:
An introduction to the finite element method in mechanical engineering. Emphasizes linear stress and strain analysis, but includes other field problems. Utilizes commercial computer codes to solve engineering related problems.

Prerequisites: Graduate Standing.

Credits: (3 hours lecture with integrated computer lab)

Text(s): David V. Hutton, Fundamentals of Finite Element Analysis, McGraw-Hill, 2004

Additional Material: ALGOR software and ALGOR’s eTechLearning website

Course Coordinator: Dr. Thomas Crippen

Topics Covered:
Fundamental equations (direct method); use of ALGOR software; bars, beams and planar elements; isoparametric elements; solids and solids of revolution; applications in stress analysis and in one or more of the following areas: fluid analysis, thermal analysis, and modal analysis.

Evaluation Methods: (only items in dark print apply):
1. Examinations / Quizzes
2. Homework
3. Lab Reports
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Objectives1: By the end of this course students will be able to:
1. Demonstrate an understanding of the fundamental concepts of the finite element method by forming the stiffness \( \times \) displacement = load matrix equations for simple structures, solving for displacement, and then computing strains and stresses. [1,2,3]
2. Select an appropriate FE element type for the physical model desired. [1,2,3]
3. Apply appropriate loads and boundary conditions to models. [1,2,3]
4. Setup for processing, process, and interpret results for linear, 2- and 3-dimensional problems using a commercial finite element code (ALGOR). [1,2,3]
5. Demonstrate the importance of checking the finite element solutions and models with "back-of-the-envelope" solutions and engineering judgment. [1,2,3]

1Numbers in brackets refer to method(s) used to evaluate the course objective.
Relationship to Program Outcomes (only items in dark print apply): This course supports the following Mechanical Engineering Program Outcomes, which state that our students will:

1. be able to apply science, mathematics, and modern engineering tools and techniques to identify, formulate, and solve engineering problems [1-5]

2. be able to design thermal/fluid, mechanical, and electro-mechanical components or systems, individually or on interdisciplinary teams, and effectively communicate those designs in both technical and non-technical forums [2-5]

3. be able to collect, analyze, and interpret data from prescribed and self-designed experimental procedures and formally communicate the results

4. be able to apply a broad-based educational experience to understand the interaction of engineering solutions with contemporary business, economic, and social issues

5. recognize that ethical behavior and continuous acquisition of knowledge are fundamental attributes of successful mechanical engineering professionals

6. pass the Fundamentals of Engineering examination.

Numbers in brackets refer to course objective(s) that address the Program Outcome.

Contribution to Meeting Professional Component: (in semester hours)

<table>
<thead>
<tr>
<th>Mathematics and Basic Sciences:</th>
<th>0 hours</th>
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</thead>
<tbody>
<tr>
<td>Engineering Sciences and Design:</td>
<td>3 hours</td>
</tr>
<tr>
<td>General Education Component:</td>
<td>0 hours</td>
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</tbody>
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Prepared By: Thomas E. Crippen      Date:    April 26, 2006