Computational methods for analysis, design, and optimization of structural components. Basic concepts in geometric modeling, finite element analysis, and structural optimization.

**Prerequisite:** ME 471 or concurrently. Open to junior or seniors in the ME major.

**Course Objectives:** Upon successful completion of this course, students can:

A. Construct finite element models using truss, frame, and plane-stress elements.
B. Analyze stress, deflection and frequency response of simple structures using finite element methods.
C. Model simple structures found in typical engineering applications using finite element software.
D. Apply basic optimization concepts to improve performance of simple structures – reduce weight, stress, deflection- using finite element software.
E. Produce reports that describe the process modeling a structural system using finite element methods; assess the accuracy of the results; evaluate the performance of the system under prescribed loading conditions; and recommend design modifications to improve performance.

**Instructor**  Prof. A. Díaz  2328J EB 353-0825
**Office Hours**  MW 10:00 – 11:00 + by apt
**TEXTBOOK**  A First Course in the Finite Element Method. Daryl L. Logan (any edition OK)
**LAB**  ANSYS Tutorial Release 14 Perfect Paperback –by Kent Lawrence
**Publisher:** SDC Publications (August 27, 2012)
**WEB PAGE**  [www.egr.msu.edu/~diaz/](http://www.egr.msu.edu/~diaz/)

**Topics**  (times approximate)

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**Grading**

| Q In class quizzes  | (−5) | 50 % | Must take quizzes in class, on scheduled dates |
| E Exam             | 15 % | Must take exam in class, on scheduled date    |
| R Homework Brief project reports  | (−4) | 20 % | No credit given for late homework            |
| P Term Project Presentation | 10 % | Thursday December 17, 3:00-5:00 p.m.  |
|                       |      | Only students present will receive credit   |
| A Attendance        | 5 %  | A=0 if more than 4 recorded absences. No other excused absence. |

**Tentative dates:**  Q: 9/16  10/5  10/19  11/4  11/23  E:12/2

Some formal notices (university policies):

1. **Academic Honesty:** The Department of Mechanical Engineering adheres to the policies on academic honesty as specified in General Student Regulations, Protection of Scholarship and Grades, and in the all-University Policy on Integrity of Scholarship and Grades, which are included in Spartan Life; Student Handbook and Resource Guide. Students who plagiarize may receive a 0.0 on the assignment or fail the course.*

2. **Accommodations for Disabilities:** Students with disabilities should contact the Resource Center for People with Disabilities to develop reasonable accommodations. For an appointment with a counselor, call 353-9642 (voice) or 355-1293 (TTY).

3. **Dropping this Course:** The last day to drop this course with a 100 percent refund and no grade reported is found on the calendar of the university. The last day to drop this course with no refund and no grade reported is also found on the same calendar. You should immediately make a copy of your amended schedule to verify you have dropped this course.

4. **Religious Observance:** If you wish to be absent from class to observe a religious holiday, make arrangements in advance with the instructor.

5. **Missing Class to Participate in a Required Activity:** To be excused from this class to participate in a required activity for another course or a university-sanctioned event, you must provide the instructor with adequate advanced notice and a written authorization from the faculty member of the other course or from a university administrator.
LAB 1: Follow truss tutorial (Alberta, web). Then solve a problem from the book
Sep 7 – 14 - 21

LAB 2: Follow beam tutorial (Alberta). Then solve a problem from the book
Sep 28 – Oct 5

LAB 3: Follow ANSYS bracket tutorial. Then solve a problem from the book
Oct 12 – Oct 19

LAB 4: Need vibration tutorial. Then solve a problem from the book
Oct 19 – Oct 26

QUIZZES
Sep 17  Oct 3  Oct 22  Nov 7  Nov 26