Course #: MATH 5315 (CRN 16644)
Course Title: Finite Element Methods I
Credit Hrs: 3
Term: Fall 2012
Course Meetings & Location: TR 13:30 – 14:50, Location: CRBL C203
Prerequisite Courses: MATH 5310 and programming experience
Course Fee (if applicable) None
Instructor: Dr. Son-Young Yi
Office Location: Chemistry and Computer Science Building 2.0324
Contact Info: E-mail syi@utep.edu
Phone (915) 747-6864

Office Hours: TR 15:00 – 16:00 or by appointment.

Textbook(s), Materials: Understanding and Implementing the Finite Element Method by Mark S. Gockenbach

Course Website: http://www.math.utep.edu/faculty yi/math5315f12.html

Course Description
This course is intended to provide a solid introduction to the finite element method (FEM) for solving partial differential equations arising in science and engineering. The formulation of FEM, their properties, stability, convergence, and mesh adaptivity will be discussed. We will also study nonconforming finite element methods and mixed finite element methods. Different types of problems such as linear elliptic equations, convection-diffusion problems, and wave-like motion will be discussed. The implementation will also be addressed via MATLAB computer projects.

Course Activities/Assignments:

Homework: Homework will be assigned regularly. Assignment will be posted on the course website and announced in class. No late homework will be accepted. Your homework should show all necessary work you used to solve problems and the reasoning and logic underlying all arguments should be clearly spelled out. Some homework assignments will involve computer programming. Computer projects must be done in MATLAB. For every assignment, turn in a complete printout of the program and of the output along with detailed explanation of solutions.

Final Project: Students will work on a final project. The topic of the project will given in early November. A short report should be submitted and the report format will be provided later.
Course Schedule: The following subjects will be covered.

**Part I: The Basic Framework for Stationary Problems**

1. Some Model PDEs
2. The weak form of a BVP
3. The Galerkin method
4. Piecewise polynomials and the finite element method
5. Convergence of the finite element method

**Part II: Data Structures and Implementation**

6. The mesh data structure
7. Programming the finite element method: Linear Lagrange triangles
8. Lagrange triangles of arbitrary degree
9. The finite element method for general BVPs

**Part IV: Adaptive Methods**

14. Adaptive mesh generation
15. Error estimators and indicators

Assessment of Course Objectives: Grade will be based on homework and a final project.

Grading Policy: Homework: 60%, Final project: 40%

Make-up Policy: N/A

Attendance Policy: It is student’s responsibility to attend every class. Students are expected to arrive for class on time and to remain for the class entire period.

Civility Statement: Please do not use cell phones, pagers, IPods, MP3 players, blue tooth devices, etc. during class. Cell phones and pagers should be set to silent or vibrate, and any calls should be taken outside of class. Please do not wear headsets or blue tooth devices during class.

Disability Statement: If a student has or suspects she/he has a disability and needs an accommodation, he/she should contact the Disabled Student Services Office (DSSO) at 747-5148 or at <dss@utep.edu> or go to Room 106 Union East Building. The student is responsible for presenting to the instructor any DSS accommodation letters and instructions.

Military Statement: If you are a military student with the potential of being called to military service and/or training during the semester, please contact me by the end of the first week of class.