CS 522 - Advanced Methods in Scientific Computing
Winter Quarter 1998

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Class Notes: These will consist of *LaTex* versions of my notes (which will be available in postscript form from the class web page), excerpts from the list of recommended references, plus several handouts.

Objectives: This course concentrates on the computational solution of 2D and 3D partial differential equations (boundary value problems) that arise in science and engineering applications.

Homework: I subscribe to the philosophy that one learns by doing, and the more doing, the better. Working through problems is an ideal way to really understand theory. Thus, we will spend a portion of time discussing practical implementation issues. Assignments will be handed out periodically throughout the quarter, collected and graded. Many problems will consist of computational implementation of the ideas discussed in lecture.

Exams: There will be no regularly scheduled exams.

Final Exam: There will not be a final exam.

Grades: A final course grade will be computed from the homework assisgnments.

Class Website: The class web page is organized into a series of directories that contain related class materials, as well as, a set of links to potentially useful computational engineering and science web sites.

Syllabus for CS 522

1. Overview and introduction [1, 2, 3, 4]
2. Introduction to field problems in science and engineering [5, 6, 1, 7, 8, 9]
3. Methods for approximating boundary value problems
   - Finite difference methods [5, 10, 1, 11, 12, 13]
   - Finite element methods
     [14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33]
   - Boundary integral methods [14, 34, 35, 36, 37]
   - Multigrid and multilevel methods
     [38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52]
4. Solution methods (solving systems of equation) [53, 54, 1, 55, 56, 57, 58, 59]
5. Mesh generation [60, 61, 62, 63, 64, 65, 66, 67, 68]
6. Adaptive methods [69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80]

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