Proposed Syllabus:
MA/CSC 783
Parallel Algorithms and Scientific Computing
Lectures: ?days,time,place?

Instructor:

R. E. White
Professor of Mathematics
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http://www4.ncsu.edu/eos/users/w/white/www/white/bob.html
Office Hours: ?days, time?

Course Objectives:

Students completing this course will be able to: (1) create parallel codes for linear equations from 3D space and system models; (2) to develop parallel algorithms for nonlinear equations; (3) to formulate parallel algorithms for linear and nonlinear eigenvalue problems; (4) to study selected current papers and student research.

Course Description:

Multiprocessing and vector architectures including current hardware and software. Parallel implementations of numerical linear algebra algorithms for matrix products, linear systems as well as nonlinear algebraic systems and eigenvalue problems. Applications to science and engineering including 3D space and system models.

Prerequisites:

MA/CSC 583, or MA/CSC 580 and some parallel algorithms.

Required Text:

Numerical Linear Algebra for High-Performance Computers
by Jack J. Dongarra, Iain S. Duff, Danny C. Sorensen, and Henk A. van der Vorst ($46)

Domain-Based Parallelism and Problem Decomposition Methods in Computational Science and Engineering
by David E. Keyes, Youcef Saad, and Donald G. Truhlar, Editors ($40)

North Carolina Supercomputing Center on www
Netlib on www
Course Organization and Scope:

I. Parallel architectures, algorithms and coding (9)
II. Solving algebraic problems from 3D space models (9)
III. Nonlinear algebraic systems (9)
IV. Eigenvalue problems (9)
V. Current research papers (9)

Assignments and Grading:

Four Homework Sets: 50%
Project and Presentation: 50%

A+ ≥ 97, A ≥ 93, A- ≥ 90
B+ ≥ 87, B ≥ 83, B- ≥ 80
C+ ≥ 77, C ≥ 73, C- ≥ 70
D+ ≥ 67, D ≥ 63, D- ≥ 60
F < 60

Deadlines:

All deadlines for homework and test dates will be announced one week in advance. Students are expected to make a very good effort to comply with these.

Academic Integrity:

The University polices on academic integrity can be found in the Code of Student Conduct at

http://www.fis.ncsu.edu/ncsulegal/41.03-codeof.htm

On the homework assignments the students may consult with each other, but each student should do the written homework reports.
Students with Disabilities:

You must contact the NCSU Disability Services for Students DSS is located in Suite 1900 of the Student Health Center. To get there, enter campus from Western Boulevard onto Dan Allen Drive. At the bottom of the hill on the right, there is a sign that reads Central Campus Pay Lot, Student Health Services, Patient Parking. Please park in this pay lot. Accessible parking is available and parking tickets can be validated at the end of your visit. Enter the back door of the Student Health Center from the parking lot. Suite 1900 is on the left after the second set of automatic doors.

http://www.ncsu.edu/equal_op/dss/

Laboratory Safety:  No Lab.

Pass-through Charges:  None
Grading will be 50% from four homework sets and 50% from a project and presentation. Professor White has used the project and presentation for the last four times the course has been offered. This replaced two exams and was done to tailor the course to the students, who usually were well into their research work and with minimal “support” on parallel computations. Professor White has been very satisfied with the following four-step procedure to the project and feels that it has helped the students communicate with each other and has made the course much more interactive.

First, very early in the course students were asked to prepare a one page description of why they were taking this course, what they wanted from the course and how it related to their research. Also, they were to propose a tentative project, which should be related to parallel computation and possibly to other course work or research. Second, the instructor would read these to see if the proposed topics were suitable, make any adjustment to the content of the course and suggest some literature that might be useful. At this point the student should come to a firm commitment on a topic, and this should be done at about the third or fourth week. Third, a written report should be completed by about the thirteenth week. The report should have a good description of the problem, parallel algorithms to be used and some parallel computations. Fourth, a 20-minute presentation, similar to one would give at a research conference, is given to the class. The relative weight to each step is 10% for the project identification, 25% for the written report and 15% for the oral presentation.