Proposed Syllabus:
MA/CSC 583
Introduction to Parallel Computing
Lectures: ?time, days, room?

Instructor:

R. E. White
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Office Hours: ?time, days?

Course Objectives:

Students completing this course will be able to: (1) understand the message passing subroutines for parallel computations; (2) implement and execute message passing codes related to matrix products; (3) the solution of linear algebraic systems via domain decomposition, conjugate gradient and generalized minimum residuals; (4) apply message passing to heat and mass transfer 2D space models.

Course Description:

Introduction to basic parallel architectures, algorithms and programming paradigms; message passing collectives and communicators; parallel matrix products, domain decomposition with direct and iterative methods for linear systems; analysis of efficiency, complexity and errors; applications such as 2D heat and mass transfer.

Prerequisites:

CSC 302 or MA 402 or MA/CSC 428 or MA/CSC 580.

Required Text:

Primary

Parallel Programming with MPI by Peter Pacheco
Published by Morgan Kaufmann Publishers for $51
Multiprocessing Codes by R. E. White on www

Secondary

MA 402(chapter two), MA/CSC 580(chapter six) by R. E. White on www
North Carolina Supercomputing Center on www
Netlib on www

Course Organization and Scope:

I. Survey of parallel architectures, algorithms and programming paradigms
- shared and distributed architectures (3)
- parallel algorithms and matrix-vector products (3)
- OpenMP, HPF, Parallel Matlab (1)
- basic MPI: summation, matrix-vector products (3)

II. MPI collectives and communicators
- collective subroutines and explicit algorithms (5)
- communicators and matrix-matrix products (5)

Test on MPI Programming.

III. Linear algebraic systems and domain decomposition
- Gauss elimination and parallel libraries (2)
- domain decompostion and gedd.f (3)
- sor.f and sordd.f (3)
- adi.f (2)

IV. CG, GMRES and parallel preconditioners
- quadratic minimization (2)
- conjugate gradient and cg.f (2)
- preconditioners: ssor,adi,ilu,idd,ils,sch (2)
- least squares minimization (2)
- generalized minimum residual and gmres.f (2)

Test on Parallel Algorithms.

Open Lectures: review, testing and current interest such as
multigrid, search and image processing (5)

Assignments and Grading:

Test on MPI Programming:	25%
Test on Parallel Algorithms:	25%
Eight Homework Sets:	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 weak 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.