CSCE 569: PARALLEL COMPUTING

Catalog Course Description:
569—Parallel Computing. (3) (Prereq: knowledge of programming in a high level language; MATH 526 or 544) Architecture and interconnection of parallel computers; parallel programming models and applications; issues in high performance computing; programming of parallel computers.

Prerequisite(s) By Topic:
Introductory programming
Linear algebra

Textbook(s) and Other Required Material:
Michael Quinn, *Parallel Programming in C with MPI and OpenMP*, McGraw-Hill, New York, NY, 2004.

Computing Platform: Various parallel machines as availability permits; MPI and OpenMP; programming in C or FORTRAN.

Course Objectives: {Assessment Methods Shown in Braces}
1. Describe the architecture of parallel computers {tests}
2. Describe several scientific problems for which parallel computation is required for their effective solution {tests}
3. Describe the nature of computations suitable for programming on a parallel computer {tests}
4. Program a parallel computer in a high level language with parallel features {programming assignments, tests}

Topics Covered:
1. Parallel computer architecture: processors, memory hierarchies, interconnect (9 hours)
2. Parallel computing languages and paradigms (9 hours)
3. Commonly parallelized algorithms and kernels (15 hours)
4. Case studies (6 hours)
5. Reviews and tests (3 hours)

Laboratory Projects and Other Course Work: Programming assignments, large programming project, quizzes, exams.

Difference between Undergraduate and Graduate Work: In addition to the work required of undergraduates, graduate students will be required to write a research proposal for a possible extension of their project work.

Syllabus Flexibility: High. Parallel computing and scientific computation are very broad, and the textbook, syllabus, and choice of topics to be emphasized can vary substantially.

Relationship of Course to Program Outcomes:

The contribution of each course objective to meeting the program outcomes is indicated with the scale:

3 = major contributor, 2 = moderate contributor, 1 = minor contributor. Blank if not related.

Course Objectives	Program Outcomes										
	1. Logic & Math	2. Computing Fundamentals	3. Apply Computing Principles	4. Work on teams	5. Communicate Effectively	6. Liberal arts & Soc. Sciences	7. Basic Science and Lab Procedures	8. Learn New Tools & Processes	9. Employed upon Graduation	10. Application Area	11. Electronics and Digital Sys Design
1. Describe the architecture of parallel computers		3	3								
2. Describe several scientific problems for which parallel computation is required for their effective solution		3	3								
3. Describe the nature of computations suitable for programming on a parallel computer			3								
4. Program a parallel computer in a high level language with parallel features		3	3					3	2		

Estimated Computing Category Content (Semester hours):

Area	Core	Advanced	Area	Core	Advanced
Algorithms		1	Data Structures		
Software Design			Programming Languages		
Computer Architecture		2			

Estimated Information Systems Category Content (Semester hours):

Area	Core	Advanced	Area	Core	Advanced
Hardware and Software	2		Networking and Telecommunications		
Modern Programming Language			Analysis and Design		
Data Management	1		Role of IS in an Organization		
Quantitative Analysis			Information Systems Environment		

Oral and Written Communication: None

Social and Ethical Issues: Some discussion is expected on social and ethical issues surrounding high end computation. These include government sponsorship of high end computing research in the absence of market demand and export controls on high end computing.

Theoretical Content:
Parallelization of algorithms

Analysis and Design:
Implementation of parallel algorithms

Class/Laboratory Schedule:
Lecture: 3 periods of 50 minutes or 2 periods of 75 minutes per week

Course Coordinator: Duncan Buell

Modification and Approval History
Initial description prior to February 2001
Revised February 2001
Revised June 2005 by Caroline Eastman based on previous CSCE 564 course syllabus and course materials from Duncan Buell. (The CSCE 564 syllabus has been revised to reflect its current status.)