

## COURSE OUTLINE OF RECORD

<b>Dept., Number</b>	CSC 4322	<b>Course Title</b>	Parallel Computing
<b>Semester Hours</b>	3		
<b>Year</b>	2006	<b>URL (if any):</b>	

### Current Catalog Description:

This specific course is an introduction to the practical and theoretical foundations of parallel processing. Topics include data and control parallelism, the PRAM of parallel computation, parallel processor organizations, parallel programming languages and paradigms, scheduling, and a variety of parallel algorithms. Laboratory projects include design and implementation of parallel algorithms on a network or a parallel simulator. Prerequisite: CSC 3321

### Textbook:

Parallel Programming 2<sup>nd</sup> edition. by Barry Wilkinson, Michael Allen, Pearson Education (Prentice Hall)

### Course Goal:

The goal of this course is to have the student experience the process of building a cluster, parallel computer system and then implementing a sophisticated application using the system.

### Prerequisites by Topic:

The ability to program in C++.

Familiarity with concepts in operating systems, system software, Windows, and data structures.

### Major Topics Covered in the Course (number of weeks):

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|---|---|--------|
| • | General parallel systems – Chapter 1                                  | 3 hrs  |
| • | Structure and definition of a parallel, asynchronous computing system | 15 hrs |
| • | Message Passing Systems Chapter 2                                     | 6 hrs  |
| • | Parallel Computations Chapter 3                                       | 3 hrs  |
| • | Pipelined Computations Chapter 5                                      | 6 hrs  |
| • | Load Balanced Systems Chapter 7                                       | 6 hrs  |
| • | Shared Memory Systems Chapter 8                                       | 6 hrs  |

### Laboratory Projects:

1. Implementation of a cluster system for a parallel computation system (6 weeks)
2. Implementation of a parallel software system over the cluster (6 weeks)

### Estimate Curriculum Category Content (Semester hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms	1		Data Structures		
Software Design			Prog. Languages	1	
Comp. Arch.	1				

### Oral and Written Communication:

The instruction in this course is based on class lectures, reading assignments, home or lab assignments, term paper and presentation, and exams. Typically, every student is required to submit a research paper of four to six pages, prepare transparencies and give a presentation. Most students also serve as presentation moderators and write a brief report on their moderated session. Every student is expected to answer questions in class on their assignments, to explain and justify their solutions, and to answer questions and participate in discussions on the whole course material.

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**Social and Ethical Issues:**

Ethical issues are covered through informal class discussion on current news related to ethics in computer science. For example, students are asked to discuss ethical and legal responsibilities in a case of computer virus development and distribution. The class time spent on ethics discussion is about 15 minutes.

**Theoretical Content:**

This course covers theoretical foundations of parallel computing, including parallel computer architectures, parallel computing paradigms, and complexity issues related to parallel algorithms.

**Problem Analysis:**

Parallel computing paradigms are explored through detailed analysis of their manifestation in specific sample parallel algorithms and programs. Students are expected to analyze, evaluate, and compare various parallel algorithms and programs.

**Open-Ended Design:**

This course covers design of efficient message-passing parallel algorithms and common design trade-offs, such as the memory-speed tradeoff. Students discuss and evaluate various design choices during the analysis of particular parallel algorithms and programs.