

University of Texas at El Paso  
Spring 2010

# CS 5334 Parallel and Concurrent Programming

Instructor: John Korah

Course website: <http://blackboard.utep.edu/>

## **ClassDetails**

CRN # : 26242

Class times: Monday, Wednesday 6.00PM -7.20PM

Classroom : 321, Computer Science Building

Office hrs : Monday to Friday 10.30AM – 12 Noon or by appointment (email)

TA : This class does not have a TA

## **Contact Details**

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## **Objectives**

This is an introductory graduate level course with focus on parallel computing. Research in parallel computing straddles diverse areas such as algorithms, networks and computer architecture. One of the aims of the course is to help student get a broad overview of these important topics in parallel computing. In addition to helping the student implement parallel applications, there is an emphasis on studying the underlying theoretical aspects such as design and analysis of parallel algorithms.

## **Topics (Tentative)**

1. Introductory material
2. Parallelism – Computer Architecture Perspective
3. Parallel Models – Shared and Distributed memory models
4. Interconnection networks
5. Performance metrics
6. Parallel frameworks
7. Design and analysis of parallel algorithms
8. Numerical algorithms
9. Non-numerical algorithms
10. Applications- scientific computing
11. Distributed memory programming with MPI

## 12. Shared Memory programming with OpenMP (if time permits)

### **Textbook**

- A. Grama, G. Karypis, V. Kumara and A. Gupta, "Introduction to Parallel Computing," 2nd Ed., Addison Wesley, 2003

### **Prerequisites**

There are no strict pre-requisites for this course. Previous exposure to computer science subjects such as basic discrete mathematics, algorithm theory and computer organization will help in better understanding the course materials. Students will be assumed to have experience with C/C++ programming which is essential for completing the programming assignments.

### **Grading**

Grading will be based on a combination of assignments, programming assignments, term paper presentation and final project. There are no exams in this course. The break-up of the grading is

Homework Assignments	15%
Programming Assignment	20%
Topic paper/presentation	35%
Final Project	30%

Homework/programming assignment: is individual work. Assignments will be posted on the website along with the submission dates.

Topic presentation: Students will be formed into teams of two. Each team will select a topic from the list provided by the instructor. Each team will seek to understand the important works, identify trends and provide their take on the topic. They will then present a 40 min presentation (including questions). The team will also prepare a HW assignment to test the class on the material. The students will solve the HW assignments in 5 topics of his/her choice.

Final project: is a semester long project. Therefore the project should seek to understand/solve an important research problem that has a substantial parallel computing component. It should involve non-trivial implementation using the parallel computing concepts taught in class. The students may work in teams (preferably 2 or 3). Individual work is also allowed. Students may select a topic on their own or will be given a topic by the instructor. However, the topic has to be approved by the instructor. The team will give two presentations and a written report: 1) a preliminary presentation on the problem, the

methodology used to solve it, expected results, etc and 2) a final presentation with implementation details, and discussion of results.

### **Format**

The classes will consist primarily of lectures, punctuated by student presentations. In-class discussions are strongly encouraged. Lecture notes and reading assignments will be posted on the course website. Additional reading material will also be posted as and when required. Regular one-on-one meetings will be scheduled by the instructor to discuss the progress of the research paper/presentation and the final project.

### **Computing Resources**

Programming assignments will be completed using the parallel computing resource at National Center for Supercomputing Applications (NCSA), University of Illinois at Urbana-Champaign (<http://www.ncsa.illinois.edu/>). User id and resources will be allocated by the instructor by the 3<sup>rd</sup> week of class.

### **Special Needs**

Students with special needs or disabilities should contact the instructor for special accommodations. They should also contact the Disabled Student Services Office (Room 106 E. Union) at 747-5148, or e-mail to [dss@utep.edu](mailto:dss@utep.edu).

### **Code of conduct**

The standards of student conduct posted at <http://studentaffairs.utep.edu/Default.aspx?tabid=4386> will be followed. Violations will be reported to the Dean of Students. Homework/programming assignments are individual work; collaboration or discussions between students should be limited to general principles related to the questions and not specific solutions. Any form of plagiarism is strictly prohibited. While preparing reports and presentation, please provide adequate citations.