

CS 8625 High Performance Computing

Dr. Ken Hoganson

5:00PM – 7:45PM Tuesday & Thursday

**Course
Description:**

A study of High-Performance computing architectures, programming techniques, theoretical and practical parallel speedup alternative mechanisms and limitations. Include a brief introduction to Quantum Computing principles and projected applications.

**Prerequisites:
Textbook:**

CS 8422 or permission of Director
Fundamentals of Parallel Processing, Jordan and Alaghband, Prentice Hall, ISBN 0-13-901158-7

Instructor:

Dr. Hoganson

Office:

Clendenin 3027

Email Address:

khoganso@kennesaw.edu

Phone:

770-499-3402

Office Hours:

See faculty home page: <http://science.kennesaw.edu/~khoganso>

Fax Number:

770-423-6731

**Website
Address:**

<http://science.kennesaw.edu/~khoganso>

**Course
Objectives:**

- Study high-performance computing architectures from single processor performance enhancements, through shared-memory multiprocessors and interconnection networks to distributed multi-computers.
- Study parallel processing theory, learn alternative mechanisms to take advantage of parallel opportunities, understand the limitations of parallel processing.
- Study parallel programming techniques, including multithreading, understand the performance of parallel algorithms, implement algorithms and projects in code.

**Learning
Outcomes:**

- As a result of completing this course, students will understand approaches to high performance computing systems, and evaluate the performance advantages of different architectural designs.
- Students will demonstrate an understanding of the different mechanisms to achieve parallel speedup, be able to identify opportunities for parallelism, predict the realizable speedup and performance bounds.
- Students will demonstrate their ability to implement parallel algorithms in code..

Assessment:

Midterm Exam	35%
Projects	30%
Final Exam	35%

All exams, homework, and problems are to be the individual student's work. You may consult other students on homework problems, short of collaboration on a joint project, which is not allowed. No assistance of collaboration on exams is allowed.

Grade Evaluation

A	90% - 100%
B	75% - 89%
C	60% - 75%
F	59% or below

Tentative Summer 2005 Topic Outline: Subject to change

Week	Topic	Chapters
1	Course intro, syllabus, overview	1
1	Opportunities for parallelism	2
2	Vector algorithms and architectures	3
2	MIMD multiprocessors	4
3	MIMD continued	4
3	Distributed Memory Multiprocessors	5
4	Distributed Memory Multiprocessors	5
4	Midterm Exam	
5	Interconnection networks	6
5	Interconnection networks	6
6	Data Dependence and Data Flow	7
6	Synchronization and data sharing	8
7	More on modeling parallelism	9
7	Parallel models	9
8	Parallel I/O	10
8	Project Due and Final Exam	

JUNE 2006	
May 28	First Day of Classes for semester/first day for CS 8625
June 26:	Last Day to Withdraw Without Academic Penalty

JULY 2006	
July 3-5:	Holiday – NO CLASSES
July 23:	Last Day of Classes
July 24 - 28:	Final Exams
July 29 & 30:	Graduation
AUGUST 2006	

Class Format: Lecture & discussion, with lab assignments. Lectures will be recorded and available for review throughout the semester

Lecture Notes: on class web site

Assignments: on class web site

Project Requirements: on class web site, will include one formal presentation

Additional Resources: on the class web site

Attendance Policy:

Attendance at all classes is highly encouraged. Concepts and ideas discussed in one class are used as building blocks for more concepts and ideas in the next class. A student can get behind very easily by skipping classes, resulting in a poor understanding of the material.

Withdrawal Policy:

Ceasing to attend class or oral notice thereof DOES NOT constitute official withdrawal and will result in the rendering of a grade of “F” for the class. Students wishing to withdrawal after the scheduled change period (add/drop) must obtain and complete a withdrawal form from the Academic Services Department in the Registrar’s Office.

Enrollment Policy:

Only those students who are enrolled in the class may attend lectures, view recorded lectures, receive assignments, take quizzes and exams, and receive a grade in the class.

Electronic Devices

In order to minimize the level of distraction, all beepers and cellular phones must be on quiet mode during “in-class” meetings. Students who wish to use a computer/PDA for note taking need prior approval of the instructor since key clicks and other noises can distract other students.

Academic Integrity Statement:

Every KSU student is responsible for upholding the provisions of the Student Code of Conduct, as published in the Undergraduate and Graduate Catalogs. Section II of the Student Code of Conduct addresses the University's policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to University materials, misrepresentation/falsification of University records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the University Judiciary Program, which includes either an "informal" resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct's minimum one semester suspension requirement.

Frequently students will be provided with "take-home" exams or exercises. It is the student's responsibility to ensure they fully understand to what extent they may collaborate or discuss content with other students. No exam work may be performed with the assistance of others or outside material unless specifically instructed as permissible. If an exam or assignment is designated "no outside assistance" this includes, but is not limited to, peers, books, publications, the Internet and the WWW. If a student is instructed to provide citations for sources, proper use of citation support is expected. Additional information can be found at the following locations.

<http://www.apa.org/journals/webref.html>

<http://www.lib.duke.edu/libguide/citing.htm>

<http://bailiwick.lib.uiowa.edu/journalism/cite.html>

<http://www.cas.usf.edu/english/walker/papers/copyright/ipdummie.html>

APA Documenting Examples:

When any portion of another author's work is used, whether it be from a course textbook or outside work, including the World Wide Web, in whole, in part, or paraphrased, that work must be cited. Proper citation formats are provided on the reverse of this document. Failure to do so can result in Academic Misconduct Proceedings. Acceptable Reference Formats (from North and Blade, 1998 (see below) reprinted with permission)

There are two components to a proper citation: the text citation and the reference or endnote. The text citation will usually consist of the author's or authors' last name(s) and the year of the publication. The endnote citation will read as follows:

Books

(Author. Date. Book Title. Publication Data.)

A reference for a single-author book:

North, M. M. (1996). Virtual reality technology. New York: Best Press.

A reference for a multi-author book:

North, M. M. & Blade, R. A. (1998). How to build skills for research. Colorado Springs: IPI Press.

Journals

(Author. Date. Article Title. Journal Title. Publication Data.)

Journal Reference

Kelly, F. G. (1997). Networking made efficient. Journal of Computer Networking. 45(3), 54-61.

(Here is an article in Volume 45, Issue 3, spanning pages 54-61)

Conference Proceeding

Vanner, F. D. (1996). A survey of medical issues using virtual reality. Proceedings of the Virtual Reality Medical Technology. 119-132. Nice, France.

APA Documenting Examples Continued:

World Wide Web (from <http://www.apa.org/books/pubmant.html>):

(Author. Date. Page Title. Publishing Information. Retrieval Date. WWW URL)

Entire site no specific page

Kidspsych is a wonderful interactive Web site for children (<http://www.kidspsych.org>).

No reference entry is needed.

Citing Specific Documents on a Web Site:

American Psychological Association. (1995, September 15). APA public policy action alert: Legislation would affect grant recipients [Announcement]. Washington, DC: Author. Retrieved January 25, 1996, from the World Wide Web: <http://www.apa.org/ppo/istook.html>

An independent document (no author identified): 1

Electronic reference formats recommended by the American Psychological Association. (2000, August 22). Washington, DC: American Psychological Association. Retrieved August 29, 2000, from the World Wide Web: <http://www.apa.org/journals/webref.html>

If the primary author is not available for the body citation, the first key word is to be used (Electronic, 2000).

STUDENT EVALUATION OF COURSE:

A standard questionnaire will be administered during the last two weeks of the semester in all classes. Additional questions developed by the college or instructor(s) may be included as well. It is important that each student provide meaningful feedback to the instructor(s) so that changes can be made in the course to continually improve its effectiveness. We value student feedback about the course, our teaching styles, and course materials, so as to improve our teaching and your learning. At a minimum, the following two questions will be asked: 1) Identify the aspects of the course that most contributed to your learning (include examples of specific materials, exercises and/or the faculty member's approach to teaching and mentoring), and 2) Identify the aspects of the course, if any, that might be improved (include examples of specific materials, exercises and/or the faculty member's approach to teaching and mentoring).

Acquiring Final Grades:

In an effort to better utilize our technology resources, Kennesaw State University has instituted the reporting of end of term grades by phone. This is in addition to the web version of grades, which has been in effect for several terms. All Spring Semester 2001 term students may call 770-420-4315 and select Option Number 4 to secure their end of term grades. With this new development, printed grade reports will not be mailed at the end of the term. Students needing verification of grades or enrollment should request either an official transcript or an enrollment verification through the Office of the Registrar.