

CSE 5441: Introduction to Parallel Computing

Course Description

Parallel programming models; sequential and parallel performance issues; high-performance computer architecture; design, analysis, implementation and performance evaluation of parallel algorithms.

Prior Course Number: CSE 621

Transcript Abbreviation: Intr Parallel Comp

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Senior, Masters, Doctoral

Course Offerings: Autumn

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Pre-req: (CSE 2231 and CSE 2321 and (CSE 2421 or ((ECE 2560 or ECE 265) and CSE 2451)) and (Math 2568 or Math 568 or Math 571)) or graduate standing.

Exclusions: Not open to students with credit for CSE 621

Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.0901

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
BS CSE	BS Computer Science and Engineering
MS CSE	MS Computer Science and Engineering
PhD CSE	PhD Computer Science and Engineering

Course Goals

Be competent with the fundamental factors affecting the performance of sequential programs
Be competent with program transformations to enhance data locality and improve performance.
Be familiar with the prevalent parallel programming models.

Be familiar with design, implementation and analysis performance analysis of parallel programs.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Fundamental performance issues	1.5							
Cache and its impact on performance	4.5							
Loop Transformations for performance enhancement	3.0							
Data dependence analysis	3.0							
Overview of parallel architectures and programming models	3.0							
Shared-memory parallel programming	6.0							
Message passing	6.0							
Programming GPUs	6.0							
Programming for high performance with short-vector SIMD instruction sets	6.0							

Grades

Aspect	Percent
Assignments	40%
Midterm exam	25%
Final exam	35%

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
**	a	An ability to apply knowledge of mathematics, science, and engineering.
***	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
***	c	An ability to design a system, component, or process to meet desired needs.
	d	An ability to function on multi-disciplinary teams.
**	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
**	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

BS CSE Program Outcomes

Course Contribution		Program Outcome
**	a	an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering;
***	b	an ability to design and conduct experiments, as well as to analyze and interpret data;

Course Contribution		Program Outcome
***	c	an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations;
	d	an ability to function on multi-disciplinary teams;
**	e	an ability to identify, formulate, and solve engineering problems;
*	f	an understanding of professional, ethical, legal, security and social issues and responsibilities;
*	g	an ability to communicate effectively with a range of audiences;
*	h	an ability to analyze the local and global impact of computing on individuals, organizations, and society;
**	i	a recognition of the need for, and an ability to engage in life-long learning and continuing professional development;
*	j	a knowledge of contemporary issues;
***	k	an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional;
***	l	an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
***	m	an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
**	n	an ability to apply design and development principles in the construction of software systems of varying complexity.

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