

CSCE 5160 Parallel Processing

You May Want To Know

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Grader:

Tentative Breakdown of Course Grade

1 Mid-semester exam	20%
Final	20%
Homework/programming	25%
Term Project	25%
Discretion	5%

The course is designed to introduce issues involved in parallel programming along with some analysis of parallel algorithms. Programming exercises will involve the use of MPI, OpenMP and/or Pthreads.

Prerequisites: Programming in C, C++, Understanding of Single CPU systems, Data Structures, Algorithms, Unix.

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Course Outline

1. Introduction	3 hours
Motivation	
Multiprocessor architectures, Networking	
Levels of parallelism	
2. Performance Models	3 hours
Performance and Speedup	
Scalability models	
3. Communication and Coordination	4 hours
Communication models	
Synchronization models	
Analyzing communication overhead	
Analyzing synchronization overhead	
4. Parallel Programming	6 hours
Message passing and Shared memory	
Using MPI, OpenMP, Pthreads, CUDA	
5. Parallel Algorithm Design	3 hours
Task level and data level decomposition	
6. Matrix Algorithms	6 hours
Matrix inverse	
Matrix-Vector multiplication	
Matrix Multiplication	
7. Solving Linear Systems	4 hours
Iterative methods	
Conjugate Gradient Method	
8. Sorting and Searching	6 hours
Parallel sorting	
Parallel search	
9. Graph Algorithms	4 hours
Spanning trees	
Shortest paths	

Text:

A. Grama, A. Gupta, G. Karypis and V. Kumar. Introduction to Parallel Computing

Other Useful Books:

1. B. Wilkinson and M. Allen. Parallel Programming, 2nd Edition
2. M. Herlihy and N. Shavit. The Art of Multiprocessor Programming
3. J. Dongarra (Editor) The Sourcebook of Parallel Computing
4. Michael Quinn: Parallel Programming in C with MPI and OpenMP
5. M. Snir and W. Gropp. MPI: The Complete Reference
6. B. Chapman. Using OpenMP: Portable Shared Memory Parallel Programming