CSCE 5160 Parallel Processing

You May Want To Know

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Grader:

Tentative Breakdown of Course Grade

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>2 Mid-semester exams</td>
<td>40%</td>
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<tr>
<td>Final</td>
<td>20%</td>
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<tr>
<td>Homework Assignments</td>
<td>25%</td>
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<td>(including programming labs)</td>
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<tr>
<td>Term Project</td>
<td>10%</td>
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<tr>
<td>Discretion</td>
<td>5%</td>
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The course is designed to introduce issues involved in parallel programming along with efficient parallel algorithms and an analysis of the algorithms. Programming exercises will involve the use of MPI, OpenMP, Cuda, OpenCL and/or Pthreads.

CSCE 5160 Parallel Processing
Course Outline

1. Introduction
   - Motivation
   - Multiprocessor architectures, Networking
   - Levels of parallelism
   3 hours

2. Performance Models
   - Performance and Speedup
   - Scalability models
   3 hours

3. Communication and Coordination
   - Communication models
   - Synchronization models
   - Analyzing communication overhead
   - Analyzing synchronization overhead
   4 hours

4. Parallel Programming
   - Message passing and Shared memory
   - Using MPI, OpenMP, Pthreads, CUDA, OpenCL
   6 hours

5. Parallel Algorithm Design
   - Task level and data level decomposition
   3 hours

6. Matrix Algorithms
   - Matrix inverse
   - Matrix-Vector multiplication
   - Matrix Multiplication
   6 hours

7. Solving Linear Systems
   - Iterative methods
   - Conjugate Gradient Method
   4 hours

8. Sorting
   - Parallel sorting
   - Parallel search
   6 hours

9. Graph Algorithms
   - Spanning trees
   - Shortest paths
   4 hours

10. Search and optimizations
   - Load balancing
   - Termination
   4 hours

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

Useful Reference Books:
3. J. Sanders and E. Kandrot. CUDA by Example: An introduction to general purpose GPU Programming, Addison-Wesley

Others.
6. M. Herlihy and N. Shavit. The Art of Multiprocessor Programming
7. J. Dongarra (Editor) The Sourcebook of Parallel Computing
8. Michael Quinn: Parallel Programming in C with MPI and OpenMP