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>1 Mid-semester exam</td>
<td>25%</td>
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<tr>
<td>Final</td>
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<tr>
<td>Homework/programming</td>
<td>20%</td>
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<tr>
<td>Term Project</td>
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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, Cuda, OpenCL and/or Pthreads.

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

Other Useful Books:  
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