CSCE 5160 Parallel Processing

You May Want To Know

My Name: Krishna M. Kavi
My Office: F278
My Phone Number: 940-369-7216
My Office Hours: T 2:00-3:30pm, Th 5-6 pm
My Email: kavi@cse.unt.edu

Grader:

Tentative Breakdown of Course Grade

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mid-semester exam</td>
<td>20%</td>
</tr>
<tr>
<td>Final</td>
<td>20%</td>
</tr>
<tr>
<td>Homework/programming</td>
<td>25%</td>
</tr>
<tr>
<td>Term Project</td>
<td>25%</td>
</tr>
<tr>
<td>Discretion</td>
<td>5%</td>
</tr>
</tbody>
</table>

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 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, OpenCL

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 6 hours
   Parallel sorting
   Parallel search

9. Graph Algorithms 4 hours
   Spanning trees
   Shortest paths

10. Search and optimizations 4 hours
    Load balancing
    Termination

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

Other Useful Books:
2. Michael Quinn: Parallel Programming in C with MPI and OpenMP
3. M. Snir and W. Gropp. MPI: The Complete Reference
4. B. Chapman. Using OpenMP: Portable Shared Memory Parallel Programming