INTRODUCTION TO HIGH PERFORMANCE COMPUTING
CSIT 2635

Class Hours: 3.0  Instructor: 
Credit Hours: 4.0  Office: 
Laboratory Hours: 3.0  Phone: 
Revised: Spring 2011  Email: 

Catalog Course Description:
This course is designed to provide an overview of the high-performance computing technology. Topics include parallel architectures, cluster design, management and monitoring tools and techniques, performance metrics, and parallel programming paradigms.

Entry Level Standards:
The student must have college level reading and math skills; keyboarding skills of at least 28 wpm; familiarity with computer architectures and competent in at least one high-level programming language and basic knowledge of Unix/Linux operating systems.

Prerequisites:  CSIT 2410 or department approval.

Corequisites:  None

Textbook(s) and Other Course Materials:

I. Week/Unit/Topic Basis:

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<tr>
<th>Week</th>
<th>Topic(s)</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction to high performance computing</td>
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<td>2</td>
<td>Taxonomy of parallel architectures</td>
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<td>3</td>
<td>Interconnection networks</td>
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<td>4</td>
<td>Scalability and performance metrics for parallel systems. Test 1</td>
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<td>5</td>
<td>Introduction to cluster computing</td>
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<td>6</td>
<td>Cluster software and hardware</td>
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<td>7</td>
<td>Cluster installation and configuration</td>
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<td>8</td>
<td>Cluster installation and configuration</td>
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<td>9</td>
<td>Cluster management and monitoring tools. Test 2</td>
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<td>10</td>
<td>Introduction to parallel programming paradigms</td>
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<td>11</td>
<td>Introduction to MPI</td>
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<td>12</td>
<td>Using MPI in simple programs</td>
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<td>13</td>
<td>Parallel program debugging and performance tuning</td>
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<td>14</td>
<td>Parallel programming tools and libraries. Test 3</td>
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<td>15</td>
<td>Comprehensive Final Exam</td>
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II. Course Goals*:

The course will

A. Guide students to understand high performance computing architectures, parallel applications and technologies. (II, III, IV)
B. Enhance effective use of cluster computing hardware and software. (I, II, III, IV)
C. Guide students to understand parallel programming paradigms and tools. (II, IV, V)
D. Expand student understanding of troubleshooting and managing parallel systems. (I, II, IV, VI)
E. Foster student ability to understand and develop basic parallel algorithms to write parallel programs. (II, III, IV, V)

*Roman numerals after course objectives reference goals of the CSIT program.

III. Expected Student Learning Outcomes*:

Students will be able to:

1. Identify parallel systems, parallel architectures and interconnection networks. (A, B, C)
2. Explain performance metrics, data mapping and communication overheads for parallel systems. (A, C)
3. Install and configure clusters. (A, B, C, D)
4. Explain cluster management and monitoring tools and applications. (B, D)
5. Design and code parallel programs using MPI. (B, E)
6. Explain differences between shared-address and message passing parallel programming paradigms. (A, C, E)
7. Use debugging tools and techniques with parallel programs. (B, D, E)
8. Write parallel programs using built-in libraries. (C, E)

* Capital letters after Expected Student Learning Outcomes reference the course goals listed above.

IV. Evaluation:

A. Testing Procedures: 50% of grade
   There will be three tests worth 50% of the grade. A comprehensive final exam may be taken to replace a single lowest test score or to make-up for one missed test. Failure to make a passing test average may result in a grade of F for the course.

B. Laboratory Expectations: 40% of grade
   At least 6 lab assignments will be given during the semester. In addition, students may be assigned a team project. A late penalty will be imposed on any overdue assignment. Failure to make a passing average in lab assignments and team project may result in a grade of F for the course.

C. Field Work: None

D. Other Evaluation Methods: 10% of grade
   Homework assignments and/or quizzes

E. Grading Scale:
   93 – 100         A
   88 – 92          B+
   83 – 87          B
V. Policies:

A. Attendance Policy:
Pellissippi State Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. (Pellissippi State Online Catalog)

B. Academic Dishonesty:
Plagiarism, cheating and other forms of academic dishonesty are prohibited. A student guilty of academic misconduct, either directly or indirectly through participation or assistance, is immediately responsible to the instructor of the class. In addition to other possible disciplinary sanctions that may be imposed through the regular Pellissippi State procedures as a result of academic misconduct, the instructor has the authority to assign an F or a zero for the exercise or examination or to assign an F in the course. (Pellissippi State Online Catalog)

C. Accommodation for Disabilities:
Students who need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127, 132, 134, 135, 131 or by phone: 539-7153 or TTY 694-6429. More information is available at www.pstcc.edu/departments/swd/.

D. Extended College Closure:
Pellissippi State Community College is committed to the educational process and student learning. In the event of a prolonged college closure (of at least a week), the educational process will continue through the use of the college’s on-line learning environment (Desire2Learn). The instructor will post instructions, specific assignments, due dates, etc. in Desire2Learn (D2L). It is the student's responsibility to login to D2L and check posted instructions and assignments.