Class Hours: 3.0  Credit Hours: 4.0  
Laboratory Hours: 3.0  Date Revised: Spring 03

NOTE: This course is not designed for transfer credit.

Catalog Course Description:

Introduction to MPI programming including data types, functions, collective operations, language bindings, implementation issues, error handling, process creation and management, performance tuning and I/O operations.

Entry Level Standards:

College level reading and math skills; keyboarding skills of at least 20 wpm; familiarity with the LINUX, UNIX, or Windows operating systems and competent in at least one high-level programming language.

Prerequisites:

HPC 1010 (NETW 2530) of consent of instructor

Textbook(s) and Other Course Materials:

Peter S. Pacheo; Parallel Programming with MPI; Morgan Kaufmann Publishers

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>An Overview of Parallel Computing</td>
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<tr>
<td>2</td>
<td>Introduction to MPI</td>
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<tr>
<td>3</td>
<td>Using MPI in Simple Programs</td>
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<tr>
<td>4</td>
<td>Collective Communication</td>
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<tr>
<td>5</td>
<td>Grouping Data for Communication</td>
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<td>6</td>
<td>Communicators and Topologies</td>
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<tr>
<td>7</td>
<td>Dealing with I/O</td>
</tr>
<tr>
<td>8</td>
<td>Design and Coding Parallel Programs</td>
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<tr>
<td>9</td>
<td>Design and Coding Parallel Programs</td>
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</tbody>
</table>
II. Course Objectives*:

A. Use MPI library data types and functions. I II III IV

B. Use search tools, inquiries, Email, FTP, TELNET and other available resources found on the Internet to locate, use, download, upload and communicate effectively. I II III IV V

C. Write parallel programs to meet scalability, optimization and performance requirements. I II III IV

D. Demonstrate individual and teamwork standards compliance to accomplish given tasks within timeframes established. IV V

E. Use MPI tools and methods to test, and debug parallel programs. I II III IV

F. Develop skills to understand architecture and application issues in parallel program development. I II III

G. Write MPI based parallel programs to solve a wide variety of problems. I II III IV

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

III. Instructional Processes*:

Students will:

1. Produce parallel programs using MPI library. Problem Solving and Decision Making Outcome, Technological Literacy Outcome, Information Literacy Outcome, Active Learning Strategy

2. Produce a fully working end product as part of a collaborative effort for sharing with other class members. Communication Outcome, Transitional Strategy, Active Learning Strategy

3. Use the Internet as a medium for obtaining documentation and instruction and for submitting assignments. Communication Outcome, Technological Literacy Outcome, Information Literacy Outcome, Transitional Strategy

4. Develop an individual message passing based parallel application meeting specifications given. Communication Outcome, Technological Literacy Outcome, Information Literacy Outcome, Problem Solving and Decision Making Outcome, Transitional Strategy, Active Learning Strategy

5. Use professional tools to produce software components and documentation. Technological
Literacy Outcome, Transitional Strategy, Personal Development Outcome

6. Practice elements of the work ethic such as punctuality, professionalism, dependability, cooperation, and contribution. Personal Development Outcome

7. Participate in a peer review of term projects. Problem Solving and Decision Making Outcome, Communication Outcome, Transitional Strategy, Active Learning Strategy

8. Use professionally accepted methods and materials in completion of program development. Technological Literacy Outcome, Transitional Strategy, Active Learning Strategy, Personal Development Outcome

*Strategies and outcomes listed after instructional processes reference Pellissippi State’s goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

Upon successful completion of this course, the student should be able to:

1. Understand scope of MPI in solving parallel problems. A, F

2. Use basic MPI data types and derived data types. A, C, E, G

3. Use point-to-point communication and collective communication to perform specific tasks. A, C, G

4. Use groups, contexts and communicator to perform specific tasks. A, C, G

5. Find resources and information to perform specific tasks. B, E

6. Use web pages and search tools effectively. B, G

7. Use communication tools effectively. B, D

8. Show effective operational use of available utilities, products, software and hardware. A, C, E, F

9. Use program debugging and performance tuning skills. A, E

10. Produce applications, documentation, sources of information, and tests in a timely, well-organized manner. B, D, E

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures:

Exams will comprise 50% of the final grade. Three exams will be given during the course of the semester. The first two exams are worth 150 points. The final exam is comprehensive and is worth 200 points. There will be no make-up tests unless prior arrangements have been made with the instructor.

B. Laboratory Expectations:

Programming assignments will be made during the course of the semester. A late penalty may
be imposed on any overdue assignment. Failure to satisfactorily complete all labs may result in a grade of F in the course. Labs will count for 200 points (20%) of the final grade.

C. Programming Project:

A team project will be assigned to solve a problem in the field of high performance computing. Failure to satisfactorily complete the project may result in a grade of F in the course. Project will count for 200 points (20%) of the final grade.

D. Other Evaluation Methods:

A number of quizzes and short assignments will be assigned throughout the semester. Most of these will be announced in the class/lab in which they are to be completed and graded.

E. Grading Scale:

<table>
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<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90 - 100</td>
<td>A</td>
</tr>
<tr>
<td>80 - 89</td>
<td>B</td>
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<tr>
<td>70 - 79</td>
<td>C</td>
</tr>
<tr>
<td>60 - 69</td>
<td>D</td>
</tr>
<tr>
<td>0 - 59</td>
<td>F</td>
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VI. Policies:

A. Attendance Policy:

Attendance is required in both the lecture and lab session. Pellissippi State Technical 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.

B. Academic Dishonesty:

Plagiarism, cheating, software piracy, non-educational use of computer systems and other forms of academic dishonesty are strictly 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.

C. Other Policies:

Each student is expected to do his/her own work in this class. If a student is unable to complete an assignment on his/her own, it is the student’s responsibility to get help from the instructor (before the assignment is due). In the event that the student has an emergency beyond his/her control, the student must notify the instructor in advance, if at all possible.