CS 475 – Introduction to Parallel Computing

Catalog Description: Theoretical and practical survey of parallel processing, including a discussion of parallel architectures, parallel programming language, and parallel algorithms. Programming one or more parallel computers in a higher-level parallel language.

Credits: 4

Prerequisites: CS 325

Courses that require this as a prerequisite: None

Structure: Three 50-minute lectures per week

Instructors: Mike Bailey

Course Content:
- Kinds of parallelism
- Parallel computer architectures (processor arrays, centralized memory multiprocessors, distributed memory multiprocessors, and multicomputers)
- Parallel algorithm design
- Performance analysis
- The MPI library of message-passing functions
- Data decompositions
- Development of data-parallel programs
- Development of manager-worker programs with functional parallelism

Learning Resources:
- *Parallel Programming in C with the Message Passing Interface,* Michael J. Quinn (required)
- *Parallel Programming with MPI,* Peter. S. Pacheco (optional)

Measurable Student Learning Outcomes:
At the completion of the course, students will be able to…
1. Compute speedup, efficiency, and scaled speedup of parallel computations, given appropriate data (ABET Outcomes: A, B, J)
2. **Apply** Amdahl's Law to predict the maximum speedup achievable from a parallel version of a sequential program, given its execution profile (ABET Outcomes: A, B, J)
3. **Analyze** the isoefficiency of a parallel algorithm (ABET Outcomes: A, B)
4. **Explain** the relative advantages and disadvantages of mesh, hypercube, and butterfly networks with respect to diameter, bisection width, and number of edges/node (ABET Outcomes: A, B, J)
5. **Explain** the advantages and disadvantages of constructing parallel computers using commodity off-the-shelf components (ABET Outcomes: C, J)
6. **Create and benchmark** a parallel program that exhibits collective communications (ABET Outcomes: C, I, J)

7. **Create and benchmark** a parallel program that exhibits one-to-one communications (ABET Outcomes: C, I, J)
8. **Create and benchmark** a parallel program that performs file I/O (ABET Outcomes: C, I, J)
9. **Create and benchmark** a parallel program that has a block allocation of data to processors (ABET Outcomes: C, I, J)
10. **Create and benchmark** a parallel program that has a cyclic allocation of data to processors (ABET Outcomes: C, I, J)

Students with Disabilities:
Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.

Link to Statement of Expectations for Student Conduct, i.e., cheating policies
http://oregonstate.edu/admin/stucon/achon.htm