

CS 594 – 29622

Understanding Parallel Architectures: From Theory To Practice

Web page for the course:
<http://www.cs.utk.edu/~dongarra/WEB-PAGES/cs594-2002.html>

CS 594 – 29622
Wednesday's 1:30 – 4:00

- ◆ **Understanding Parallel Architectures: From Theory To Practice**
- ◆ **Spring 2002 - 3 credits**
 - > Jack Dongarra, Professor
- ◆ **Class will meet in Room C205, Claxton Building**
- ◆ **TA: Jeffery Chen <zchen@cs.utk.edu>**

2

To Get Hold of Us

- ◆ **Email: dongarra@cs.utk.edu**
 - > Room: 413, Claxton
 - > Phone: 974-8295
- ◆ **Office hours:**
 - > Wednesday 11:00 - 1:00, or by appointment
- ◆ **TA: Jeffery Chen <zchen@cs.utk.edu>**
 - > Room: 351, Claxton
 - > Phone: 974-9985

3

Schedule of Topics

- ◆ Introduction
- ◆ Parallel Programming Models and Machines
 - > Shared Memory and Multithreading
 - > Distributed Memory and Message Passing
 - > Data parallelism
- ◆ Sources of Parallelism in Simulation
- ◆ Algorithms and Software Tools (depends on student interest)
 - > Dense Linear Algebra
 - > Partial Differential Equations (PDEs)
 - > Load balancing, synchronization techniques
 - > Sparse matrices
 - > Visualization and monitoring
 - > Debugging parallel programs
 - > Sorting and data management
 - > Metacomputing
- ◆ Applications (including guest lectures)
- ◆ Project Reports

4

Grades Based on:

- ◆ 30% on weekly homework (the lowest homework grade will be dropped)
- ◆ 30% on a written report and presentation (20 pages circa.)
- ◆ 30% on a final exam (2 hours)
- ◆ 10% on class participation.

5

Homework

- ◆ Usually weekly
- ◆ Lowest grade will be dropped
- ◆ Must be turned in on time (no late homework)
- ◆ Don't copy someone else's homework.
- ◆ Sometimes problems, sometimes programming assignment, sometimes requiring running a program to find the solution.

6

Homework (continued)

- ◆ We expect an analysis and detailed discussion of the results of your efforts.
 - >The program itself is not very interesting.
- ◆ Programming in C or Fortran or Java.
- ◆ Will go over the assignments the following week.
- ◆ See class web page weekly for details.

7

Project

- ◆ Topic of general interest to the course.
- ◆ The idea is to read three or four papers from the literature (references will be provided)
- ◆ Synthesize them in terms of a report (~20 pages)
- ◆ Present your report to class (~30 mins)
- ◆ New ideas and extensions are welcome, as well as implementation prototype if needed.

8

Final Exam

- ◆ In class
- ◆ Will cover the material presented in the course
- ◆ ~2 hours

9

Material

- ◆ There is no book covering the complete scope for the class.
- ◆ For each lecture a set of slides will be made available in postscript or html.
- ◆ Other reading material will be made available electronically if possible.
- ◆ The web site for the course is:
 - > <http://www.cs.utk.edu/~dongarra/WEB-PAGES/cs594-2002.html>

10

What will we be doing?

- ◆ Learning about:
 - >High-Performance Computing.
 - >Parallel Computing
 - >Performance Analysis
 - >Computational techniques
 - >Tools to aid parallel computing.
 - >Developing programs using PVM, MPI, HPF, and perhaps OpenMP.

11

Background

- ◆ C and/or Fortran programming
- ◆ Knowledge of parallel programming
- ◆ Some background in numerical computing.

12

Computer Accounts

- ◆ For much of the class computing you can use one of our set of computer clusters. More on this later
- ◆ If you have an account in the Department you have access to the TORC cluster: torc1 through torc8.
- ◆ Cluster of PC's:
 - > <http://icl.cs.utk.edu/internal/iclhelp/clusters.html>

13