**Professor:** Torgersen

**Office Phone:** 758-5536

**Office Hours:** Monday and Wednesday 3:00 to 4:00. Friday 11:00 to 12:00. Also by appointment.

**Text:** Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, *Introduction to Parallel Computing.*

**Facilities:** SGI Origin 2000 (kokua), WFU Linux Cluster (deac), Sun 5140.

**Goals:**

1. Overview of Parallel Architecture Designs
   (a) Pipelining and superscalar instructions
   (b) Shared memory and memory issues, (e.g., contention, cache coherence)
   (c) Message passing and communication issues
   (d) Traditional interconnect topologies
   (e) Vector processors (e.g., Altivec, IBM Cell)

2. Overview of Parallel Computing Paradigms
   (a) Fine grain vs coarse grain parallelism
   (b) Data parallelism vs functional parallelism
   (c) Light weight threads
   (d) Shared memory parallel programming directives (e.g., OpenMP, SGI)
   (e) Message passing (MPI)

3. Theory: Parallel time complexity

4. Hands-on
   (a) Parallel programming projects. Cache issues.
   (b) Include problems from a variety of disciplines, e.g., image processing, problems from your thesis research.
   (c) Develop skill in programming with concurrent threads.
   (d) Program correctness: you can’t verify a parallel program by testing!!

5. Some widely-studied parallel problems,
   (a) Matrix algorithms
   (b) Sorting
   (c) Graph algorithms

6. The Holy Grail: Data dependency analysis

7. Automatic detection of parallelism (as time allows)

**Expectations:**

1. Class participation.
2. Communicate if things get complicated.
3. Your best effort.
**Grading:**
Two exams (50%), a few take home problem sets (20%), as many programming projects as we can produce (30%).

**Disability Notice:**
If you have a disability that may require an accommodation for taking this course, then please contact the Learning Assistance Center (758-5929) within the first two weeks of the semester.

**Pandemic Planning Notice:**
The University has requested that faculty collect personal contact information as part of emergency planning and preparation. The information you provide is strictly confidential.