DEPARTMENT CIS

AUTHOR(S) Peter Chapin

COURSE NUMBER CIS-4230

COURSE TITLE Parallel Programming

SHORT TITLE Parallel Programming

COURSE LEVEL 4000

DATE CREATED 4/2/2010

CHECKED/CHANGED 9/6/2017

PREREQUISITES CIS-2230 and CIS-3050

COREQUISITES Click here to enter corequisites (ex. **UWB 9998**, **UWB 9999**); if NA, leave blank

RESTRICTIONS Click here to enter any restrictions on enrollment; if NA, leave blank

SPECIAL FEES Click here to enter “**Yes**” or “**No**”

CREDITS 3

HOURS 3

SEMESTER Spring

COURSE DESCRIPTION This course examines the applications, algorithms, construction, configuration and performance of parallel programs. Topics include shared memory parallelism using POSIX threads and OpenMP, and multi-machine parallelism using MPI. Parallel programming on modern GPU devices is also introduced.

SUGGESTED TEXTS Principles of Parallel Programming by Calvin Lin and Lawrence Snyder; Addison Wesley; Copyright 2008; ISBN=978-0-321-48790-2.

OPTIONAL TEXTS Click here to enter optional texts; if NA, leave blank

COURSE OUTCOMES Understand the range of parallel programming options available. Understand the issues and approaches for safely controlling concurrency. Effectively write programs that take advantage of multiple threads in a shared memory system. Effectively write programs that take advantage of message passing in a multi-machine cluster. Write simple programs that take advantage of GPU based computing.

COURSE CONTENT Introduction; approaches and applications for parallelism. Amdahl's Law and Flynn's Taxonomy. POSIX Thread creation and destruction. Shared memory synchronization primitives. Parallel decomposition via recursion. Performance tradeoffs with parallelism; caching effects, thread pools. OpenMP. Lock free programming in shared memory systems. Memory models. Cluster software and its configuration. MPI. Communication networks and protocols. Parallel decomposition in clusters. GPU programming.

LAB OUTCOMES Click here to enter lab outcomes; if NA, leave blank

LAB CONTENT Click here to enter lab content; if NA, leave blank

LECTURE CAPACITY Click here to enter capacity (standard VTC lecture cap is 32)

LAB CAPACITY Click here to enter capacity (standard VTC lab cap is 16)

GRADED OR P/NP Graded

EVALUATION Homework, Projects, Final Exam. In the graduate version of this course (CIS-5230): Read and summarize two papers selected by the instructor, and one paper of their own choosing (approved by the instructor). Complete a "graduate project" specified by the instructor in place of one of the regular projects that delves more deeply into the subject matter and that includes a detailed performance analysis.

DELIVERY METHOD Click here to enter delivery method (ex. **LEC**, **LAB**, **HYB, ONL**, etc.)

ROOM REQUIREMENTS Click here to enter room requirements (ex. **Telepresence**)

AUTHOR’S NOTES Click here to enter optional author’s notes; if NA, leave blank