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| **ELEMENT** | **CONTENT** |
| DEPARTMENT | CIS |
| AUTHOR (S) | Peter C. Chapin |
| COURSE NUMBER | **CIS 4230** |
| COURSE TITLE | **Parallel Programming** |
| SHORT TITLE | Parallel Program |
| COURSE LEVEL | 4000 |
| DATE CREATED |  |
| CHECKED/CHANGED | 2017-11-06 |
| PREREQUISITES | CIS 2230, CIS 3050 |
| COREQUISITES |  |
| RESTRICTIONS |  |
| SPECIAL FEES | No |
| CREDITS | 3 |
| HOURS | 3 hours of lecture per week |
| SEMESTER | As required |
| 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 | *Introduction to Parallel Programming*; Peter S. Pacheco |
| OPTIONAL TEXTS |  |
| COURSE OUTCOMES | The successful student will be able to:   1. Understand the range of parallel programming options available 2. Understand the issues of approaches for safely controlling concurrency 3. Write programs that take advantage of multiple threads in a shared memory system using the POSIX Threads API 4. Write programs that take advantage of directive based methods such as OpenMP 5. Write programs that take advantage of message passing in a multi-machine cluster using MPI 6. Write programs that take advantage of GPU based computing using CUDA and OpenACC |
| COURSE CONTENT | 1. Introduction 2. Approaches and applications for parallelism 3. Amdahl’s law and Flynn’s taxonomy 4. POSIX thread creation and destruction 5. Shared memory (POSIX Thread) synchronization primitives 6. Parallel decomposition via recursion 7. Performance tradeoffs with parallelism 8. Caching effects 9. Thread pools 10. OpenMP 11. Lock-free programming in shared memory systems 12. Cluster software and its configuration 13. MPI 14. Cluster network configurations and communications patterns 15. Parallel decomposition in clusters 16. GPU programming with CUDA 17. GPU programming with OpenACC |
| LAB/STUDIO OUTCOMES |  |
| LAB/STUDIO CONTENT |  |
| LECTURE CAPACITY | 21 |
| LAB CAPACITY |  |
| GRADED OR P/NP | Graded |
| EVALUATION |  |
| DELIVERY METHOD | ONL |
| ROOM REQUIREMENTS | No room |
| AUTHOR’S NOTES |  |