ITCS 5145 Parallel Computing
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On-line

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This course is an introductory course in Parallel Computing for first year graduate Computer Science and Engineering students. Parallel computing uses multiple cores, processors, or computers to solve problems at a greater computational speed. Computer systems with multiple execution cores are now commonplace, and in the future we are likely to see systems with a large number of processor cores. Programming such systems or a collection of such systems is now an imperative skill to learn for Computer Science and Engineering students. Parallel and Distributed computing is now a required knowledge area in the IEEE/ACM 2013 CS curriculum.

This course begins with programming shared memory and multicore computers using a thread model, with programming in OpenMP. Then programming interconnected computers using a message passing model is covered with programming in MPI. A new pattern programming approach to parallel programming will be introduced including parallel programming software tools developed at UNC-Charlotte and UNC-Wilmington. Pattern programming uses parallel design patterns that are well tested and known arrangements to solve common problems and provide scalable design structures. Programming with higher-level pattern programming tools is much easier and less likely to be flawed. Examples of the parallel design patterns include workpool, pipeline, divide and conquer, iterative stencil, iterative all-to-all, and data-parallel patterns. We continue in the course with various parallel algorithms. Hybrid programming is introduced, which uses combinations of shared memory and message systems. Finally we cover programming GPUs for high performance computing using CUDA.

Students will be provided with a pre-configured VirtualBox virtual machine (Ubuntu OS) with all the required software to do most of the programming on their own computer although instructions are also provided so that students can install the software natively on a Linux OS. Each student will also be provided an account on a department parallel programming cluster to test their programs in this environment.

As an on-line class, formal class periods are not scheduled. Instead materials are provided for each week on-line, including slides, sample quiz questions, assignment materials, and videos of the Fall 2014 lectures. A weekly study guide guides you through the materials to study and any required assignments and quizzes. All materials are provided on Moodle. The instructor will be available through email, Skype, Moodle Saba meetings scheduled weekly, and physical office hours.

Prerequisites:
CCI Graduate Standing or permission of the instructor (for graduate students outside CCI)**.**
Typically first year graduate Computer Science and Engineering students.

This course uses C as the underlying language mainly. There is a little Java.
For more information, contact the instructor by email (abw@uncc.edu).