Description: Techniques of parallel and distributed computation. Develop and reuse parallel models or programs in simulation and visualization. Design and analysis of computational structures, algorithms and programs based on general parallel computer models and using the LIPS240 super-cluster. Understanding and addressing issues in inter-processor communication and synchronization, so as to effectively utilize parallel computing resources. Convert existing application programs to run on the LIPS240 platform so as to fully realize size and speed gains.

Motivation: The purpose of this course is to develop attendees’ ability to appreciate and utilize the power of parallel and distributed computing. Its objective is to provide the necessary algorithmic techniques and reusable tools so that such computing resources can effectively solve problems in research and application. For large-scale modeling and simulation, the recent installation of a general purpose 240-processor super-cluster (with the aggregate power of 120GHz speed, 123GB memory and 2 Terra-Bytes of disk storage), named LIPS240, not only places the College of Engineering at UH among a few elite universities with its own supercomputing environment for education, experimentation and application development but also creates new opportunities for campus-wide joint projects and for community-business outreach collaborations.

Books and References (Copies of sections and papers will be provided):
1. Miller, Russ and Boxer, Laurence: Algorithms Sequential & Parallel – A Unified Approach, 2000, Printice Hall. (If you buy any book it should be this one.)


The course consists of four interleafed components with overlapping periods of coverage:

a) Models and algorithms for parallel and distributed computing (8 weeks).
b) Multi-Processor Interface, program reusability and application development (6 weeks).
c) Simulation and visualization techniques in scientific and engineering computation (5 weeks).
d) Interprocessor and intercomputer communication, synchronization and scheduling (3 weeks).

Students’ work will include understanding models of parallel computing, applying algorithmic techniques to practical problems, using the LIPS240 computing resource effectively, and developing one or more application programs of the student’s own interest/choice (with relevance and consent). Algorithm development and programming skills in C (Fortran, etc.) is needed, but devotion is more critical. Course performance (C/NC ok) will be evaluated more on efforts and derived benefits, less on traditional exams and homework/programming assignments.