COSC 420 HIGH PERFORMANCE COMPUTING  
(Tentative)

Description: The course will study principles, practices, and implementations of parallel and distributed computing. It covers three areas of high performance computing: modern computing architectures, algorithm design, and applications and programming. Through this course, students will not only learn fundamental concepts of high performance computing but also gain hands-on hardware and programming experience in this field.

Prerequisite: Computer Science II (COSC220), Microcomputer Organization (COSC250); each with a grade of C or better

Credits: 4 units


References:

TOPICS

Introduction to High Performance Computing
Limits of Sequential Computing, Concurrency and Performance Analysis
Flynn’s Classical Taxonomy: SISD/SIMD/MISD/MIMD

Parallel Processing, Memory Architecture, Modern Supercomputing
Multistage Interconnection, Shared Memory: UMA/NUMA, Distributed Memory, Hybrid Memory

Distributed Systems and High Performance Computing (HPC)
The HPC Stack, Grid Computing, Cloud Computing, Job Scheduling, Load-Balancing

HPC Design and Construction
Linux HPC as Supercomputing platform, HPC Stack implementation on ARM and i686 Architectures (via commodity hardware: Raspberry Pi and desktop PC), Network Engineering, Administration, Security, Monitoring

Parallel Programming Model and Algorithm Design Principles
Programming Models and Languages; Message Passing; Data Parallel Algorithm Design, Decomposition, Dependency; Multi-Thread Programming in Python/POSIX; Parallel programming with OpenMP/MPI

Tests 1.0

EVALUATION
Presentations, Labs, Programs, and Projects 70%
Tests and Final Exam 30%

REC 1/2016