SU DEPARTMENT OF COMPUTER SCIENCE SYLLABUS
COSC 420 – *High-Performance Computing*

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.

Prerequisites: Grade of "C" or better in COSC 320
Required Text: None.
Supplemental References:

- Introduction to High Performance Scientific Computing, by Victor Eijkhout.
- Using MPI: Portable Parallel Programming with the Message-Passing Interface (3E), by Gropp, Lusk, and Skjellum, 2014.
- "Programming Massively Parallel Processors: A Hands-on Approach",D.Kirk and W. Hwu, Morgan Kaufmann, 2010.

TOPICS

	Weeks
Introduction Limits of Sequential Computing, Concurrency and Performance Analysis.	***2.0***
Parallel Processing, Memory Architecture, Modern Supercomputing Multistage Interconnection, Shared Memory: UMA/ NUMA, Distributed Memory	***2.0***
Distributed Systems and High Performance Computing (HPC) Matplotlib, Scikit, categorical and numerical data, graph types and stylistic choices	***2.0***
Parallel Programming Model and Algorithm Design Principles Programming Models and Languages; Message Passing; Data Parallel Algorithm Design;Multi-Thread Programming with OpenMP/MPI.	**3.0**
Applications to Scientific Programming Numerical algorithms, basics of numerical linear algebra, distributed sorting, distributed graph algorithms, distributed dynamics and simulation	**2.0**
HPC Design and Construction Linux HPC as Supercomputing platform, HPC Stack implementation on ARM and i686 Architectures	**2.0**
Exams	***1.0***

EVALUATION

Projects, labs, class participation: 60-80%
Exams and quizzes: 20-40%

JTA/jlh 05/2021