COURSE OVERVIEW

Full Course Title: High-Performance Computing

Instructional Hours (Contact Hours): 40

Course Description:

This course introduces the fundamentals of high-performance. It is targeted to scientists, engineers, scholars, really everyone seeking to develop the software skills necessary for work in parallel software environments. These skills include big-data analysis, machine learning, parallel programming, and optimization. We will cover the basics of Linux environments and bash scripting all the way to high throughput computing and parallelizing code.

Learning Outcomes:

- Navigate a typical Linux – Based HPC environment
- Describe the components of a high-performance distributed computing System.
- Assess the differences between serial and parallel programming
- Estimate speedup and efficiency by generating a Scaling Study.

Learning Activities:

☒ Class Discussions/Discussion Boards   ☒ Student Projects

☒ Peer-to-Peer Work (pairs, small groups)   ☒ Readings

☒ Written Assignments (reports, essays)   ☒ Textbook/Workbook Exercises

☒ Case Study Analysis   ☒ Other: Click to enter

Methods of Assessment/Grading Criteria:

☒ Class/Discussion Boards Participation   ☒ Individual Projects/Presentations

☒ Written Assignments (reports, essays)   ☒ Group Projects/Presentations

☒ Exams/Quizzes   ☒ Other: Click to enter

Course Topics:

- Linux Introduction
  - Architecture
  - File system
  - Commands
  - Distributions
  - Package management - APT, YUM, RPM, DNF
- What is Cluster
- Building a Cluster
- Hardware components
- IP configuration
- IP forwarding
- IPMI(Intelligent Platform Management Interface) configuration
  - BMC configuration
  - DRAC configuration
- Infinity Band Network
- IB features and configuration
- Host file setup
- NFS
- NIS
- Password less SSH
- Job scheduler
  - Slurm

- ▪ OpemPBS
- ▪ Torque
- OpenMPI
- Monitoring Tool
  - ▪ Ganglia
- Benchmarking
- Application Install and Configuration
- Power Cycle procedures
- Performance and Tuning of Application and systems

Prerequisites:

- Programming skills and Linux basic commands