

# **CSE4351/5351: Course Syllabus**

## **Introduction**

- Basics of high-performance computing
- Driving forces and technology constraints
- Types of parallelism
- Classes of parallel computers, SIMD and MIMD architectures
- Multicores and GPUs
- Scalability Issues
- Interconnection networks
- Routing and communication techniques
- Clustering
- Cloud Computing

## **Basic Parallel Programming**

- Inter-process communications
- Programming models
- SIMD, MIMD and SPMD programming
- Parallelism issues
- Synchronization
- Computing styles of commercial machines

## **Performance Analysis Methods**

- Various performance measures
- Performance analysis methods
- Amdahl's Law Gustafson-Barsis Law
- Speedup and scalability
- Benchmarking

## **Parallel Paradigms and Programming Models**

- Distributed-memory message passing programming (MPI)
- Shared memory programming (Threads)
- SIMD and GPU programming
- Comparison of programming models

## **Parallel Algorithms**

- Parallelizing algorithms
- Linear equation solvers
- Matrix algorithms
- Sorting algorithms
- PDEs and FFTs

## **Resource Management**

- Scheduling techniques
- Mapping algorithms
- Static and dynamic load balancing