COL 380

Introduction to Parallel and Distributed Programming
3 credits (2-0-2)

Pre-Req: COL106, COL351, COL331

Significant overlap with COL730

Possible Topics

Possible Topics

Parallel performance analysis, Scalability, Throughput, Latency

COL 106

Possible Topics

Parallel performance analysis, Scalability, Throughput, Latency — COL 106

Parallel computer organization, Memory and Data Organizations, Inter-process communication and synchronization, Shared memory architecture, Interconnection network and routing, Distributed memory architecture, Distributed shared memory, Parallel IO, Load distribution and scheduling — COL 216, 331

Possible Topics

Parallel performance analysis, Scalability, Throughput, Latency

COL 106

Parallel computer organization, Memory and Data Organizations, Inter-process communication and synchronization, Shared memory architecture, Interconnection network and routing, Distributed memory architecture, Distributed shared memory, Parallel IO, Load distribution and scheduling

COL 216, 331

High level Parallel programming models and framework, Memory consistency, Synchronization (Locked/Lock-free).

COL 331

Possible Topics

Parallel performance analysis, Scalability, Throughput, Latency

COL 106

Parallel computer organization, Memory and Data Organizations, Inter-process communication and synchronization, Shared memory architecture, Interconnection network and routing, Distributed memory architecture, Distributed shared memory, Parallel IO, Load distribution and scheduling

COL 216, 331

High level Parallel programming models and framework, Memory consistency, Synchronization (Locked/Lock-free).

COL 331

Parallel graph algorithms, Parallel Algorithm techniques: Searching, Sorting, Prefix operations, Pointer Jumping, Divide-and-Conquer, Partitioning, Pipelining, Accelerated Cascading, Symmetry Breaking

COL 106, 351

Rough Academic Calendar

Week 1 Jan 1 - Jan 7   Week 2 Jan 8 - Jan 14

Week 3 Jan 15 - Jan 21   Week 4 Jan 22 - Jan 28

Week 5 Jan 29 - Feb 4   Week 6 Feb 5 - Feb 11

Week 7 Feb 12 - Feb 18

Mid-term exam

Week 8 Feb 26 - Mar 3   Week 9 Mar 4 - Mar 10

Week 10 Mar 11 - Mar 19   Week 11 Mar 20 - Mar 22, Apr 2-3

Mid-term break

Week 12 Apr 4 - Apr 10   Week 13 Apr 11 - Apr 17

Week 14 Apr 18 - Apr 24

Major exam

Tentative Schedule

Parallel performance analysis, Scalability, Throughput, Latency	1 week
Parallel computer organization, Memory and Data Organizations, Inter-process communication and synchronization, Shared memory architecture, Interconnection network and routing, Distributed memory architecture, Distributed shared memory, Parallel IO, Load distribution and scheduling	9 weeks Parallel architectures (cache coherence, false sharing, hardware primitives for locks) Programming frameworks (pthread, OpenMP, GPU-CUDA, MPI, mapreduce)
High level Parallel programming models and framework, Memory consistency, Synchronization (Locked/Lock-free)	1 week
Parallel graph algorithms, Parallel Algorithm techniques: Searching, Sorting, Prefix operations, Pointer Jumping, Divide-and-Conquer,	3 weeks

Rough Academic Calendar

Week 1 Jan 1 - Jan 7

Week 2 Jan 8 - Jan 14

Week 3 Jan 15 - Jan 21

Week 4 Jan 22 - Jan 28

Week 5 Jan 29 - Feb 4

Week 6 Feb 5 - Feb 11

Week 7 Feb 12 - Feb 18

introduction, performance, parallel hardware architecture, CPU parallelism (pthread, openMP), GPU parallelism (CUDA)

Mid-term exam

Week 8 Feb 26 - Mar 3

Week 9 Mar 4 - Mar 10

Week 10 Mar 11 - Mar 19

Week 11 Mar 20 - Mar 22

distributed systems programming (MPI, mapreduce), modeling

Mid-term break

Week 12 Apr 4 - Apr 10

Week 13 Apr 11 - Apr 17

Week 14 Apr 18 - Apr 24

parallel algorithm design and analysis

Major exam

Evaluation Plan

- 3 programming assignments
  - pthread + openMP 10%
  - CUDA 20%
  - MPI, mapreduce 20%
- Midterm (20%), Major (30%)

Audit criteria 30% in exams and 30% in assignments

Attendance is not mandatory, doesn't mean not coming to class is mandatory.