COL380

Introduction to
Parallel & Distributed Programming

Course Material

- http://www.cse.iitd.ac.in/~subodh/courses/COL380
  - ➡ Persistent Info: Policies, Resources, Links, Slides
- Assignments, Quizzes, Exams
  - ➡ Textbook, Reading assignments
- Lecture + Lecture videos
- Course discussion
- Urgent announcements

To contact me

- subodh@cse.iitd.ac.in
  Subject: [COL380] …
- In class

Lectures

- Flipped lectures
  - ➡ Tuesday and Friday
  - ➡ I will hand out reading and viewing material ahead of time (Moodle)
    - ▸ Videos may be pacy, please pause-absorb-read-repeat
  - ➡ No repetition in live classes, Some review possible
    - ▸ For discussion, Q&A. Recorded on request
  - ➡ Raise you hand — If not called, unmute and speak-up
- Mondays for individual tutorial, doubts, Q&A
  - ➡ And quizzes

Grading

- Assignment 0: 4
- Assignment 1: 6
- Assignment 2: 11
- Assignment 3: 11
- Assignment 4: 8
- Quizzes :13
- Minor: 17
- Major: 30

- All assignments will be checked for duplication
- Exams will be proctored: Be camera/battery ready
- Detailed protocol will be provided before exams
- Mix of Objective type and subjective type

- Final grade will be on a curve
- All tests will be normalized

Policies

- Late Assignment Submission Policy:
  - ➡ 1 marks/day of delay
  - ➡ Avoid late submission. Plan ahead.
  - ➡ In case of sickness, apply for I-grade
- Attendance Policy as per institute
- Audit Policy:
  - ➡ 40%. 30% in both Theory and Lab components + Attendance

Course Content

Introduction to concurrency, Race conditions, Atomicity, Semantics of concurrent programs, Examples of distributed algorithms, Client-Server paradigm
Parallel architecture, Flynn's classification
Shared-memory programming with reference to memory consistency, cache in-coherence, false sharing and mutual exclusion
Message passing, High level and collective constructs, Point-to-point communication, multicast and broadcast, Blocking versus non-blocking styles for communication, Message buffering
Theoretical models of parallel computation and algorithm analysis, Examples of reduction, prefix-sum
Performance metrics: Time, work, Scalability.
Task/Communication Dependence graphs, Task decomposition, Data-parallel decomposition, Pipelining
Synchronization, barriers, ~~counters/semaphores~~, Progress, Livelock/Deadlock

More Content

- OpenMP, MPI
- Map-reduce (Hadoop, Spark)
- Cuda
- Parallel Algorithms
- Distributed consensus
- Java RMI, Stream

Learning Goals

- Write scalable and efficient parallel programs
  - ➡ OpenMP, MPI, Cuda, Development tools
- Understand nomenclature, literature, documentation
- Understand, measure, predict and analyze parallel performance
- Learn the intricacies of asynchronous cooperative computing
- Examples of parallel algorithms
- Understand IO, memory p

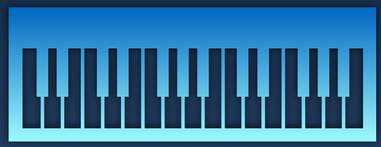
- Need OS and Architecture concepts
- Need to have background in Algorithms

Keys to success

- Be regular

- Read the textbook

- Program all assignments yourself



  - ➡ Be curious — Try variations out and see what happens

- Breathe!

- Talk to the instructor