Massachusetts Institute of Technology — Handout 2
6.852: Distributed Algorithms
Prof. Nancy Lynch — September 4, 2003

Tentative Course Schedule

Class 1 (Thursday, Sept. 4) :
Course overview. Synchronous networks. Leader election in synchronous ring networks.
Homework 1a handed out

Class 2 (Tuesday, Sept. 9) :
Basic computational tasks in general synchronous networks: Leader election. Breadth-first search. Shortest paths. Broadcast and convergecast.

Class 3 (Thursday, Sept. 11) :
Spanning trees. Minimum spanning trees.
Homework 1b handed out

Class 4 (Tuesday, Sept. 16) :
Fault-tolerant consensus. Link failures: The Two Generals problem. Process failures (stopping, Byzantine). Algorithms for agreement with stopping and Byzantine failures. Exponential information gathering.

Class 5 (Thursday, Sept. 18) :
Number-of-processor bounds for Byzantine agreement. Weak Byzantine agreement. Time bounds for consensus problems.
Homework 1 due
Homework 2a handed out

Class 6 (Tuesday, Sept. 23) :
Other kinds of consensus problems : k-agreement. Approximate agreement. Distributed commit.

Class 7 (Thursday, Sept. 25) :
Asynchronous distributed computing. Formal modeling of asynchronous systems using interacting state machines (I/O automata). Proof methods.
Homework 2b handed out

Class 8 (Tuesday, Sept. 30) :
Non-fault-tolerant algorithms for asynchronous networks.
Leader election, breadth-first search, shortest paths, broadcast and convergecast.

Class 9 (Thursday, Oct. 2) :
Spanning trees. Minimum spanning trees.
Homework 2 due
Homework 3a handed out

Class 10 (Tuesday, Oct. 7) :
Synchronizers. Synchronizer applications. Synchronous vs. asynchronous distributed systems.

Class 11 (Thursday, Oct. 9) :
Time, clocks, and the ordering of events. Vector timestamps. State-machine simulation.
Homework 3b handed out

Class 12 (Tuesday, Oct. 14) :
Stable property detection. Distributed termination. Global snapshots. Deadlock detection.

Class 13 (Thursday, Oct. 16) :
Asynchronous shared-memory systems. The mutual exclusion problem. Mutual exclusion algorithms.
Homework 3 due
Homework 4a handed out

Class 14 (Tuesday, Oct. 21) :
More mutual exclusion algorithms.
Bounds on shared memory for mutual exclusion. Resource allocation. The Dining Philosophers problem.

Class 15 (Thursday, Oct. 23) :
Impossibility of consensus in asynchronous, fault-prone, shared memory systems.
Homework 4b handed out

Class 16 (Tuesday, Oct. 28) :
Atomic objects.

Class 17 (Thursday, Oct. 30) :
Atomic snapshot algorithms. Atomic read/write register algorithms.
Homework 4 due
Homework 5a handed out

Class 18 (Tuesday, Nov. 4) :
Wait-free computability. The wait-free consensus hierarchy.

Class 19 (Thursday, Nov. 6) :
Wait-free vs. f-fault-tolerant atomic objects.
Homework 5b handed out

Tuesday, Nov. 11 :
Veteran's Day. No class.

Class 20 (Thursday, Nov. 13) :
Asynchronous network model vs. asynchronous shared memory model. Impossibility of consensus in asynchronous networks. Failure detectors and consensus. Paxos consensus algorithm.
Homework 5 due
Homework 6a handed out

Class 21 (Tuesday, Nov. 18) :
Reliable communication using unreliable channels.

Class 22 (Thursday, Nov. 20) :
Reliable communication using unreliable channels.
Homework 6b handed out

Class 23 (Tuesday, Nov. 25) :
Self-stabilizing algorithms.

Thursday, Nov. 27 : Thanksgiving Day vacation. No class.

Class 24 (Tuesday, Dec. 2) :
Timing-based systems. Modeling and verification. **Homework 6 due**
Homework 7 handed out

Class 25 (Thursday, Dec. 4) :
Timing-based algorithms for mutual exclusion and consensus.

Class 26 (Tuesday, Dec. 9) :

Atomic memory algorithms for dynamic networks. Rambo. GeoQuorums. **Homework 7 due**