Course Schedule, Version 2

Class 1 (Tuesday, Feb. 5)
Course overview. Synchronous networks. Leader election in synchronous ring networks.

Class 2 (Thursday, Feb. 7)
Leader election in rings, cont'd. Basic computational tasks in general synchronous networks: Leader election. Breadth-first search. Broadcast and convergecast. Shortest paths.
Homework 1a handed out

Class 3 (Tuesday, Feb. 12)
Spanning trees. Minimum spanning trees.

Class 4 (Thursday, Feb. 14)
Fault-tolerant consensus. Link failures: the Two Generals problem. Process failures (stopping, Byzantine). Algorithms for agreement with stopping and Byzantine failures. Exponential information gathering.
Homework 1b handed out

Tuesday, Feb. 19
Monday schedule. No class.

Class 5 (Thursday, Feb. 21)
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, Feb. 26)
Other kinds of consensus problems: k-agreement. Approximate agreement. Distributed commit.

Class 7 (Thursday, Feb. 28)
Asynchronous distributed computing. Formal modeling of asynchronous systems using interacting state machines (I/O automata). Proving correctness of distributed algorithms.
Homework 2b handed out

Class 8 (Tuesday, March 4)
Non-fault-tolerant algorithms for asynchronous networks. Leader election, breadth-first search, shortest paths, broadcast and convergecast.

Class 9 (Thursday, March 6)
Spanning trees. Gallager et al. minimum spanning trees.
Homework 2 due
Homework 3a handed out

Class 10 (Tuesday, March 11)
Synchronizers. Synchronizer applications. Synchronous vs. asynchronous distributed systems.

Class 11 (Thursday, March 13)
Time, clocks, and the ordering of events. State-machine simulation. Vector timestamps.
Homework 3b handed out

Class 12 (Tuesday, March 18)
Stable property detection. Distributed termination. Global snapshots. Deadlock detection.

Class 13 (Thursday, March 20)
Asynchronous shared-memory systems. The mutual exclusion problem. Mutual exclusion algorithms.
Homework 3 due
Homework 4a handed out

(Tuesday, March 25) Spring break. No class.

(Thursday, March 27) Spring break. No class.

Class 14 (Tuesday, April 1)
More mutual exclusion algorithms. Bounds on shared memory for mutual exclusion. Resource allocation. The Dining Philosophers problem.

Class 15 (Thursday, April 3)
Shared-memory multiprocessors. Contention, caching, locality. Practical mutual exclusion algorithms. Reader/writer locks.
Homework 4b handed out

Class 16 (Tuesday, April 8)
Impossibility of consensus in asynchronous, fault-prone, shared-memory systems.

Class 17 (Thursday, April 10)
Atomic objects.
Homework 4 due
Homework 5a handed out

Class 18 (Tuesday, April 15)
Atomic snapshot algorithms. Atomic read/write register algorithms.

Class 19 (Thursday, April 17)
Wait-free computability. The wait-free consensus hierarchy.
Homework 5b handed out

(Tuesday, April 22) Patriot's Day. No class.

Class 20 (Thursday, April 24)
Wait-free vs. f-fault-tolerant atomic objects.
Homework 5 due
Homework 6a handed out

Class 21 (Tuesday, April 29)
List algorithms: locking algorithms, optimistic algorithms. Lock-freedom.

Class 22 (Thursday, May 1)
Transactional memory: Compositionality, obstruction-freedom, disjoint-access parallelism.
Homework 6b handed out

Class 23 (Tuesday, May 6)
Asynchronous network model vs. asynchronous shared-memory model. Impossibility of consensus in asynchronous networks. Failure detectors and consensus. Paxos consensus algorithm.

Class 24 (Thursday, May 8)
Self-stabilizing algorithms.
Homework 6 due
Homework 7a handed out

Class 25 (Tuesday, May 13)

Timing-based systems. Modeling and verification. Timing-based algorithms for mutual exclusion and consensus.

Homework 7b handed out

Class 26 (Thursday, May 15)

Timing-based algorithms for consensus. Clock synchronization.

Homework 7 due