Course Schedule, Version 1

Class 1 (Thursday, September 10)
Course overview. Synchronous networks. Leader election in synchronous ring networks.
Homework 1a handed out

Class 2 (Tuesday, September 15)
Leader election in rings, cont'd. Basic computational tasks in general synchronous networks: Leader election. Breadth-first search. Broadcast and convergecast. Shortest paths.

Class 3 (Thursday, September 17)
Spanning trees. Minimum Spanning Trees (MSTs). Maximal Independent Sets (MISs).
Homework 1b handed out

Class 4 (Tuesday, September 22)
Distributed graph algorithms. Maximal Independent Set, revisited. Coloring.

Class 5 (Thursday, September 24)
Distributed graph algorithms, continued. The CONGEST model. Minimum Spanning Tree, revisited.
Homework 1 due; **Homework 2a handed out**

Class 6 (Tuesday, September 29)
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 7 (Thursday, October 1)
Number-of-processor bounds for Byzantine agreement. Weak Byzantine agreement. Time bounds for consensus problems. Early stopping algorithms.
Homework 2b handed out

Class 8 (Tuesday, October 6)
k-set-agreement. Approximate agreement. Distributed commit.

Class 9 (Thursday, October 8)
Asynchronous distributed computing. Formal modeling of asynchronous systems using I/O automata. Proving correctness of distributed algorithms.
Homework 2 due; **Homework 3a handed out**

No class, Monday schedule (Tuesday, October 13)

Class 10 (Thursday, October 15)
Non-fault-tolerant algorithms for asynchronous networks. Leader election, breadth-first search, shortest paths, broadcast and convergecast.
Homework 3b handed out

Class 11 (Tuesday, October 20)
Spanning trees. Gallager et al. minimum spanning trees.

Class 12 (Thursday, October 22)
Synchronizers. Synchronizer applications. Synchronous vs. asynchronous distributed systems.
Homework 3 due; **Homework 4a handed out**

Class 13 (Tuesday, October 27)
Time, clocks, and the ordering of events. State-machine simulation. Vector timestamps.

Class 14 (Thursday, October 29)
Stable property detection. Distributed termination. Global snapshots. Deadlock detection.
Term project proposal due; **Homework 4b handed out**

Class 15 (Tuesday, November 3)
Asynchronous shared-memory systems. The mutual exclusion problem. Mutual exclusion algorithms.

Class 16 (Thursday, November 5)
More mutual exclusion algorithms. Bounds on shared memory for mutual exclusion. Resource allocation. The Dining Philosophers problem.
Homework 4 due; **Homework 5a handed out**

Class 17 (Tuesday, November 10)
Impossibility of consensus in asynchronous, fault-prone, shared-memory systems.

Class 18 (Thursday, November 12)
Atomic objects.
Homework 5b handed out

Class 19 (Tuesday, November 17)
Atomic snapshot algorithms. Atomic read/write register algorithms.

Class 20 (Thursday, November 19)
Wait-free computability. Herlihy's wait-free consensus hierarchy.
Homework 5 due; **Homework 6a handed out**

Class 21 (Tuesday, November 24)
Wait-free vs. f-fault-tolerant atomic objects. Borowsky-Gafni simulation. Boosting fault-tolerance.

Thanksgiving Holiday (Thursday, November 26)

Class 22 (Tuesday, December 1)
Asynchronous network model vs. asynchronous shared-memory model. Impossibility of consensus in asynchronous networks. Failure detectors and consensus. Paxos consensus algorithm.
Homework 6b handed out

Class 23 (Thursday, December 3)
Failure detectors.
Homework 6 due

Class 24 (Tuesday, December 8)
Self-stabilizing algorithms.

Class 25 (Thursday, December 10)
Biological distributed algorithms. Social insect colony algorithms. Foraging, task allocation, house-hunting.
Term projects due

Extra class (optional) (Friday, December 11, 10AM until done)
Presentations of term projects.