Systems Syllabus

1 Computer Architecture

Topics:

- Computer Organization
  - RISC vs CISC
  - Integer & floating point arithmetic
  - Instruction set design
  - Addressing modes
  - Data path and instruction execution control
  - Microprogramming
  - Interrupts
- Memory hierarchy
  - Cache design
  - Memory organization
  - Mass storage
  - Virtual memory
  - Paging and segmenting
- Performance Measurement
  - Basic principles (locality, 90/10 rule, Ahmdahl's Law)
  - Instrumentation of instruction execution
  - Computation of performance metrics

Reference: "Computer Architecture", Hennessy & Patterson, 1990. Chapters 1-3, 5,6,8,9, Appendix A

2 Parallel Computer Architecture

Topics:

- Computer Organization
  - Flynn's categorization (SIMD/SISD/MISD/MIMD)
  - Instruction pipelining
  - Data/arithmetic pipelining
  - Multiprogramming
  - Multiprocessing
  - Multiple caches and cache coherency
  - Array Processing
  - Interconnection networks
- Parallel Processors
  - distributed memory multi-computers
  - shared memory multi-processors
  - globally shared distributed memory
  - clustered hierarchical memory systems
  - multi-threaded architectures

References: "Computer Architecture and Parallel Processing", Hwang & Briggs, 1984. Chapters 1,3,5,6,7,9.

"Parallel Computing, Theory and Practice", Lipovski & Malek, 1987. Chapters 1,2,4,5, Appendices B,E,G.

3 Operating Systems

Reference: "Modern Operating Systems", Tannenbaum, 1992. Chapters 1-7. (Subject to revision.)

4 Networked and Distributed Systems

Topics:

- Network architectures
  - Multiprocessors
  - Bus topologies
  - Communication protocols
  - Address protocols

- Clock synchronization
- Atomic transactions

- Distributed processing
  - Client/server
  - Multicast
  - Remote procedure call
  - Load balancing
  - Process scheduling
  - Deadlock in distributed systems
  - Networked and distributed file systems

Reference: "Modern Operating Systems", Tannenbaum, 1992. Chapters 9-13, 14.