January 20: First class meeting. Introduction to the course, administrative details. Focus of the course: Principles and Tradeoffs. Levels of transformation, Instruction supply, data supply, processing.

January 25, 27: Introduction to the CAD tools we will be using in the course. [Note: Problem set 1a is due at the beginning of Jan 27 class]


February 2: Discussion session. Review of the use of the CAD tools on the logic design of a simple ALU.

February 3: The x86 ISA in the context of ISA tradeoffs. Some implementation issues.

February 8: ISA/Microarchitecture tradeoffs

February 9: Discussion session [Problem set 1b is due at the beginning of this class].

February 10: Evolution of the uniprocessor, including SIMD, VLIW, DAE, HPS, Data Flow. The basic Superscalar, out-of-order execution model. Effective use of long pipelines without blocking. The structure of a modern pipeline. Functions at each stage.

February 15: Evolution of the uniprocessor, continued. Data Flow

February 16: Discussion session

February 17: Run-time optimizations: Trace Cache, Runahead, etc.

February 22: Discussion sessions -- Problem sets 3, 4, 5. [Problem set 2 is due at the beginning of this class.]

February 24: Multi-threading -- HEP, SMT, SSMT

March 1: Compile time optimizations: The Block-structured ISA, Predication, leading to wish branches, Braids, etc. Preview to the future: multiple levels of cache, fast track/slow track.

March 2: Discussion session.

March 3: Compile time optimizations, continued.

March 5: Problem Set 4 due in ENS 541, at 5pm.
March 8: No class. Prepare for Initial Design Review.

March 10, 11: Initial project design reviews in 537 ENS.

March 15-19: Spring break, no classes.

March 22: Branch Prediction

March 24: Branch Prediction, continued.

March 29: Review, or catch up, as needed.

March 30: Discussion session, prepare for written exam.

March 31: Written exam, in class.

April 5: Measurement methodology and abuses.

April 6: Discussion session, as needed.

April 7: RISC, a Retrospective.

April 12: Intro to Multiprocessing.

April 13: Discussion session, as needed.

April 14: Multiple processors: Cache Coherency.

April 15,16: Oral exams (exam2) in 541a ENS.

April 19: Memory consistency, transactional memory

April 20: Discussion session, as needed.

April 21: Prefetching in the context of Multi-core.

April 26: Multi-core, Multi-nonsense, and the microprocessor of the year 2020.

April 27: Discussion session, as needed.

April 28: Case Studies: Pentium M, Niagara, Cell, Power 6, GPGPUs.

May 3: Guest lecture from local industry (to be determined).

May 4: Discussion session, as needed.

May 5: Last class meeting. Review of the course.

Final project design reviews in 541a, May 6,7 by appointment.

May 9: Final project report due in 541a, 10pm.

Note: there will be no final exam in this course.