Department of Electrical and Computer Engineering
The University of Texas at Austin

EE382N, Spring 2014
Y.N.Patt, Instructor
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"Compile-time" Course Outline (aka THE Syllabus)
January 13, 2014

January 13 (Lecture 1): **First class meeting**. Intro to the course, administrative details, focus of hte course: Principles, Tradeoffs, and Implementation. Levels of transformation, instruction supply, data supply, processing.

January 15 (Lecture 2): Basic concepts in architecture and microarchitecture. Critical path design, bread and butter design, balanced design. Compile time vs. run time. Partitioning, Timing, Pipelining. Data Path, state machine, microsequencer, microinstruction definition, and microcode. Microprogramming (horizontal, vertical, two-level, dynamic microprogramming, bit steering), pipelining and pipelined control.

January 16: Discussion section, Intro to the CAD tools we will be using in the course.

January 20: Martin Luther King, Jr. Day. No classes scheduled.

January 22 (Lecture 3): The x86 ISA in the context of ISA tradeoffs. Some implementation issues.
Note: Problem set 1a is due at the beginning of this class.

January 23: Discussion session: Review the use of CAD tools on the logic design of a simple ALU.

January 27 (Lecture 4): ISA/uarch tradeoffs.

January 29 (Lecture 5): 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.
Note: Problem set 1b is due at the beginning of this class.

January 30: Discussion session.

February 3 (Lecture 6): Evolution of the uniprocessor, continued.

February 5 (Lecture 7): Run-time optimizations. Trace Cache, Runahead, etc.

February 6: Discussion session.

February 10 (Lecture 8): Multithreading -- HEP, SMT, SSMT.

February 12 (Lecture 9): Branch Prediction
Note: Problem set 2 is due at the beginning of this class.

February 13: Discussion session.

February 17 (Lecture 10): 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.

February 19 (Lecture 11): Compile time optimizations, continued.

Note: Problem set 4 is due at the beginning of this class.

February 20: Discussion session.

February 24 (Lecture 12): Integer Arithmetic.

February 26 (Lecture 13): Floating Point Arithmetic.

February 27: Discussion session, Prepare for written exam.

February 26, 27, 28: Initial Design Reviews with each Project Team.

March 3 (Lecture 14): Review or catch up.

March 5 (Lecture 15): **Written exam, in class.**

March 6: No discussion session: Enjoy Spring break!

March 10-16: Spring break, no classes.

March 17 (Lecture 16): Intro to Multiprocessing.

March 19 (Lecture 17): Cache Coherency.

March 20: Discussion session.

March 24 (Lecture 18): Memory consistency.

March 26 (Lecture 19): Measurement methodology and abuses.

March 27: Discussion session.

March 31 (Lecture 20): RISC: A retrospective.

April 2 (Lecture 21): Case studies: Microarchitectures of existing chips.

April 3: Discussion session, as needed.

April 3,4: **Oral exams (exam2) in 541ENS.**

April 7 (Lecture 22): Case studies (continued).

April 9 (Lecture 23): Case studies (continued).

April 10: Discussion session, as needed.

April 14 (Lecture 24): Current specific issues in Microarchitecture

April 16 (Lecture 25): Current specific issues in Microarchitecture (continued)

April 17: Discussion session, as needed.

April 21 (Lecture 26): Multi-core, Mega-Nonsense.

April 23 (Lecture 27): My sense as to the critical requirements for the future.

April 24: Discussion session, as needed.

April 28 (Lecture 28): Guest lecture from local industry (to be determined).

April 30 (Lecture 29): Last class meeting. Review of the course.

May 1: Discussion session, as needed.

Final project design reviews in 541a ENS, May 1,2, by appointment.
May 9: Final project report due in 541a, 10pm.

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