-- The computer -- a complex system organized in levels of interpretation.
-- The computer -- a universal computational device; given enough time
   and space it can do anything any other computational device does.

August 26,27: Discussion Session. Orientation to our computing environment, email, tools

August 30: Lecture 2: Chapter 1 (continued), Chapter 2: Bits and operations on bits.
-- The bit as a unit of information.
-- Encoding of bits: Binary numbers (integer data type, ASCII characters.
-- Negative numbers, 2's complement representation, sign-extension.
-- hex representation of binary numbers.
-- Arithmetic operations on numbers. ADD, SUB. [Note that x+x = left shift]
-- Logical operations on bits. AND, OR, NOT.

September 1: Lecture 3. Bits and operations on bits (continued).
Discussion Session. Emphasis on Chapters 1,2, problem set 1.

September 6: Labor Day, no class

September 8: Lecture 4. Chapter 2 (continued).

September 9,10: Discussion Session. Emphasis on Problem Set 1

Problem set 1, due before class, September 13.

September 13: Lecture 5. Chapter 3: Basic Logic Structures
-- The transistor as a switch
-- Basic Gates (AND, OR, NOT)
-- Truth table representations
-- Any arbitrary function can be built out of these gates
   (no attempt at minimization. Just an awareness exercise)
-- full ADDER, MUX, DECODER
-- Basic storage element (Gated RS latch)
-- A register

September 15: Lecture 6. Memory and Finite State Machines
-- a logic circuit to implement a small piece of memory (perhaps 2**2 x 3)
-- concept of memory: address space, addressability
-- The notion of state (one of the most important concepts in engineering)
-- State diagram, Next State table, State Assignment
-- Implementation example: sequential machine

September 16,17: Discussion Session. Emphasis on Chapter 3, problem set 2
September 20: Lecture 7. Finite State Machines (continued).

September 22: Lecture 8. Chapter 4: Introduction to Von Neumann model and the LC-3 ISA.
-- the basic structure of the Von Neumann model, showing the basic flow.
-- instruction = opcode, operands
-- encoding of instructions and data
-- instruction cycle (Fetch, Decode, EA, Fetch data, Execute, Store result)
-- organization of memory
-- address space, addressability revisited (MAR, MDR)
-- instruction formats
-- operate, data movement, and control instructions
-- LD/ST (also, indirec ts)
-- control (condition codes: N,Z,P)
-- The datapath necessary to implement the LC-3
-- I/O via the TRAP instruction [Keyboard in, screen out]

September 23,24: Discussion Session: Intro to LC-3, the Simulator and Program 0.

Programming Lab 0 due, 11:59pm, September 26.

Problem set 2, due before class, September 27.

September 27: Lecture 9. Chapter 4 (continued), Chapter 5, the LC-3 ISA, its data path and control

September 29: Lecture 10. A sophisticated LC-3 program
-- a detailed example in machine language
-- example will use keyboard input, monitor output.
-- example will include entering data via the keyboard and outputting on the monitor

September 30, October 1: Discussion Session: Chapter 5, PL1

Programming Lab 1 due, 11:59pm, October 3.

October 4, Lecture 11. Chapter 6: Structured Programming and Debugging
-- Elements of Problem Solving (stepwise refinement, systematic decomposition, etc.)
-- Fundamentals of Debugging (setting breakpoints, single-step, deposit, examine, etc.)
-- the control structure of a stored program (sequential, conditional, iteration)


October 10,11: Discussion Session: Prepare for Midterm exam.

Problem set 3, due before class, October 11.

October 11: Lecture 13. Review or catch up!


October 14,15: Discussion Session: Go over exam, discuss Programming Lab 2.

October 18: Lecture 15. Chapter 7: Moving up a level, Assembly Language and the Assembler.

-- going from higher to lower level: interpretation vs. translation
-- translation: what do assemblers and compilers do?
-- hand assemble programs from earlier lectures.
-- revisiting the character count problem

October 21,22: Discussion Session: Emphasis on Chapter 7 and Programming Lab 2.

October 25: Lecture 17. Chapter 8: JSR/RET, Stack

October 27: Lecture 18. Stack (continued), Subroutines (JSR/RET)
-- saving/restoring state
-- success/failure mechanisms

October 28,29: Discussion Session: Data Structures, Problem set 4, Programming Lab 3

NOTE: Oct 28 is the last day to drop a course without special permission, and to change grading to pass/fail.

Programming Lab 2 due, 11:59pm, October 31.

Problem set 4, due before class, November 1.

November 1: Lecture 19. Queues, Linked Lists, Character Strings
-- tradeoffs between sequential allocation and linked lists for sorted information

November 3: Lecture 20. Recursion, other data structures (if there is time).

November 4,5: Discussion Session: Data Structures, Emphasis on Programming Lab 3

November 8: Lecture 21. Chapter 9: Physical I/O.
-- asynchronous activity
-- memory mapped vs. special I/O instructions
-- program control vs. device (interrupt) driven
-- device registers (KBDR, KBSR, DDR, DSR)
-- Synchronization via the ready bit.
-- interrupt enable bit
-- I/O Service Routines


November 11,12: Discussion Session: Prepare for Midterm 2, Programming Lab 4

Programming Lab 3 due, 11:59pm, November 14.

Problem set 5, due before class, November 15.

November 15: Lecture 23. Review or catch up.


November 18,19: Discussion Session: Go over Exam 2, Emphasis on Programming Lab 4

November 22: Lecture 25. Chapter 9 (continued) TRAPs and Interrupts
November 24: No class, Thanksgiving Recess. Enjoy the Holiday!

**Programming Lab 4 due, 11:59pm, November 28.**

November 29: Lecture 26. Chapter 9 TRAPs, Interrupts (continued).

December 1: Lecture 27. Chapter 10: Chapter 10 The Calculator, life after EE306
-- ASCII/2’s-complement conversion
-- Stack arithmetic
-- The Calculator, itself
-- Parallelism. The latest hot button!
-- Preview of coming attractions: The ARM ISA and its THUMB instruction set

December 2,3: Discussion Session: Traps, Interrupts, Programming Lab 5

**Programming Lab 5 due, December 5, 5pm**

December 6: Lecture 28. Last lecture. Free-for-all. Any OTHER questions!

**Problem set 6, not to be handed in, use for final exam preparation.**

December 10. **Likely date of the Final Exam, 7 to 10pm.**
(Note: the Registrar may change the date of the final exam at his discretion. Please do not make plans to leave campus for the semester break until after the date of our final exam is confirmed by the Registrar’s office.

**Programming Labs:**

0th programming Lab Due September 26, 11:59pm.
1st programming Lab (machine language) -- Due: October 3, 11:59pm.
2nd programming Lab (assembly language) -- Due: October 31, 11:59pm.
3rd programming Lab (assembly language) -- Due: November 14, 11:59pm.
4th programming Lab (assembly language) -- Due: November 23, 11:59pm.
5th programming Lab (assembly language) -- Due: December 5, 5pm.

**Problem Sets:**

1st problem set, (emphasis on Chapters 1,2). Due: just before class, September 13.
2nd problem set, (emphasis on Chapter 2,3). Due: just before class, September 27.
3rd problem set, (emphasis on Chapter 1-6). Due: just before class, October 11. (Note: exam on October 13)
4th problem set, (emphasis on Chapter 7,8). Due: just before class, November 1.
5th problem set, (emphasis on Chapters 8,9). Due: just before class, November 15. (Note: exam on November 17)
6th problem set, (emphasis on Chapter 9,10). Not to turn in.