Topics to Review: The following topics are fair game on the first exam. Remember, you are allowed to bring a review sheet to the exam that fills one side of an 8.5x11" piece of paper. Also remember to bring a calculator.

- Transducers

    - Resistive Transducers (e.g., strain gages, thermistors)
    - Differential Capacitors
    - LVDTs
    - Thermocouples
    - Piezoelectrics

- Detection Circuits

    - Wheatstone Bridge
    - Reactance Bridge
    - RLC Divider

- Amplifiers

    - Buffers
    - Inverting, Non-inverting
    - Summing
    - Differential, Instrumentation
    - CMRR
    - Non-ideal op amp characteristics (e.g., bias current, slew rate, resistor selection)

- Passive and Active Filters

    - LPF, HPF, Bandpass, Bandstop
    - Identify and derive transfer functions and cutoff/resonant frequencies for first- and second-order filters
    - Bode plots (sketch and interpret)
    - Design "simple" filters
    - Integrators and differentiators

- Comparators (with hysteresis)

- Relays and Transistors (to the level covered in lab and problem sets; used for isolation, switching and one-bit ADC)

- Binary Numbers

    - You do not need to know offset binary, 2's complement, octal, hexadecimal, BCD.
    - You do need to know how to convert between base10 $\leftrightarrow$ base2.

- Logic Gates & Truth Tables

- D & JK Flip Flops

- Shift Registers & Counters

- Analog-to-Digital Conversion

  – Saturation and quantization

  – Sampling frequency and aliasing

  – One-bit ADC

  – Flash ADC

  – Successive approximation (general approach, not details of schematic)

- Digital-to-Analog Conversion

  – Summer with scaled resistors

  – R-2R Ladder

  – Need for LPF

- Miscellaneous

  – Know the difference between zero-order, first-order and second-order systems

  – Input/output impedance

  – Noise (different types, ways to actively and passively reduce noise at different stages in circuits)

  – Resolution, sensitivity, accuracy, precision

Types of Questions to Expect

- Evaluate a circuit

  – Solve for voltages and currents

  – Sketch waveforms of outputs or mid-circuit nodes

  – Modify a circuit to change its behavior

  – Early errors will not hose you, but you must show all of your work!

- Design a circuit

  – Block diagrams are your best friend!

  – Always state your assumptions

  – More than one way to do it

- Explain / define something

- There will be no "plug-and-chug" problems; think homework problems with the ante upped a bit.

- There will be no LabVIEW questions.