P.E. Gray **6.002: Circuits and Electronics** **Spring 2003**

Handout S03-001

Week of Monday	Tuesday Lecture	Wednesday Recitation	Thursday Lecture	Friday Recitation
1) February 3	Subject purpose and policies. Static two-terminal elements, Concept of valves, Mosfet as a bistatic switch. Mosfet model, inverter. ***READ 2.3, 2.4***	**Collect schedule cards** L.C. EXCEPT SR MOSFET SWITCH MODEL Use two and three input NAND and NOR gates to review voltage and current divider concepts. Series and parallel combinations ***HW1 OUT***	The Digital Abstraction, Signal Definitions, noise margins. Cascaded gates. ***READ 6.1-6.5, 6.9***	Examples of gate applications, Static power calculations.
2) February 10	Systematic analysis of resistive circuits, Assignment of Node-To-reference voltages, node equations ***READ 3.1 - 3.3***	Examples of circuit analyses using node equations. Introduce "Supernode" ***HW 2 OUT***	Definition of linearity, superposition. ***READ 3.5***	Examples of use of superposition ***HW1 IN***
3) February 17 President's Day Holiday	Monday Schedule of classes to be held No 6.002 Lecture	More circuit examples ***HW3 OUT***	Thevin and Norton Equivalent circuits ***READ 3.6***	Graphical analysis of circuits with a single nonlinear element ("load lines") ***HW2 IN***
4) February 24 Lab 1 this week	Concept of semiconductor diodes. Piecewise-linear models of nonlinear elements, use in circuit analysis ***READ 17.1, 17.2,4.1,4.2***	Examples of analysis with nonlinear elements, diode applications ***HW4 OUT***	Mosfet as an amplifier, Display characteristic as parametric family, SCS model. Dependent sources ***READ 7.1-7.4***	Examples of mosfet circuits. Graphical analysis of inverter development of transfer function ***HW3 IN***
5) March 3	Linearization around an operating point. Small-signal mosfet model, square-law current source model ***READ 8.1 - 8.2.3***	Examples of analysis of amplifier circuit***s*** ***HW5 OUT*** ***Evening quiz #1 MAR 5***	Mosfet circuits with source feedback. Source follower analyis gain and output resistance. ***READ 8.2.4***	Recitations cancelled ***DELIVERY HW4 to TAs***

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6) **March 10**	Delays in mosfet gates. Gate capacitance, transient analysis of first-order circuit with step input. ***READ 9.1-9.3***	Examples of first-order circuit analysis with step inputs ***HW6 OUT***	Inductors and capacitors as energy storage elements. transient analysis ***READ 9.5***	More circuit analysis with a single energy storage element. ***HW5 IN***
7) **March 17** **LAB 2 this week**	Singularity functions: impulse, step, and ramp, impulse response. Introduce Lab 2 ***READ 10.1-10.3, 10.6***	Examples of first-order transients with impulses. Establishment of conditions at t=o+ ***HW7 OUT***	Loading in a mosfet gate, Gate delays, digital memory ***READ 12.1-12.3***	More examples of transient analysis with initial conditions. Zero-input and zero-state response ***HW6 IN, READ 10.5***
8) **March 24**	←	**Spring Break**		→
9) **March 31**	LC Circuit with impulse excitation. Transient responses and energy exchange ***READ 13.1-13.3,13.5***	Second-order transient response with damping ***HW8 OUT***	Sinusoidal exitation in first-order circuits: use of complex exponentials, Euler elationship, complex amplitudes ***READ 14.1-14.3***	Examples of sinusoidal steady state analysis SSS using complex excitation ***HW7 IN***
10) **April 7**	Frequency response, Bode plots, RC bandpass filter example ***READ 14.4,14.5***	More SSS Examples ***HW9 OUT*** ***Evening quiz #2 APR 9***	LC filters, analysis and Bode plots ***READ 15.1, 15.2***	Recitations cancelled ***DELIVER HW8 to TAs***
11) **April 14** **Lab 3 this week**	Complex plane. Correlation of time domain and frequency domain responses, poles and zeros Introduce Lab 3 ***READ 14.6***	Instructor's choice about SSS ***HW10 OUT***	Introduction to operational amplifiers, feedback Inverting amplifier OP-AMP models ***READ 16.1-16.5***	OP-AMP Examples multiple inputs, determination of output resistance ***HW9 IN***
12) **April 21**	Patriot's Day, Two-day vacation No 6.002 lecture	OP-AMP circuits and applications	***DROP DATE!*** Positive feedback, ocillators, clocks ***READ 16.6-16.8***	OP-AMP examples,clock or Schmitt trigger analysis ***HW10 IN***

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13) **April 28**	Pendulum, mechanical clock, electronic clock. Phase plane analysis	More OP-AMP circuit examples ***HW11 (Lab 4 Prelab) OUT***	Energy and power in mosfet gates, NMOS and CMOS, static and dynamic losses ***READ 6.10***	Examples of OP-AMP circuit using the non-linearity ***HW11 IN***
14) **May 5** **Lab 4 this week**	Modulation and demodulation Demonstration of a simple AM receiver Introduce Lab 4.	Diodes in AC to DC power conversion output smoothing	Last day for Assignments due Integrated circuit and systems technology	
15) **May 12**	Illustration of a DC-to-DC converter	Instructor's choice	Last day of classes violating the abstraction barrier	