1. **Number and title of course**: EECS 40, Introduction to Microelectronic Circuits

2. **Course objectives**: This course is intended to teach basic circuit theory and principles of electronic engineering as preparation for subsequent EE courses.

3. **Topics covered**:
   - Introduction to circuits: currents and voltages; power and energy; Kirchhoff’s Current Law; Kirchhoff’s Voltage Law; branches, loops and nodes
   - Resistive circuits; Thévenin and Norton equivalent circuits; Node/Mesh/Superposition analysis
   - Inductance and capacitance; L and C transients; 1st and 2nd order circuits
   - Phasors; Frequency response; Bode plots; Resonance; Transfer function; Filters (1st and 2nd order filters)
   - Operational Amplifiers: Ideal operational amplifiers; Inverting and non-inverting amplifiers; Design of simple amplifiers; Op-amp imperfections in the linear range of operation; Integrators and differentiators;
   - Diode circuits: Basic concepts; Load-line analysis of diode circuits; Ideal-diode model; Piecewise-linear diode models; Rectifier circuits; voltage doubler
   - Semiconductors; n and p doping; bandgap
   - Diode physics: Gauss’s Law and Poisson Equation; Depletion approximation; IV characteristics
   - MOSFET physics: NMOS and PMOS transistors and simple fabrication concepts
   - MOSFET circuits: Load-line analysis; Bias circuits; Small-signal equivalent circuits; Common-source amplifiers; Source followers
   - Binary logic, truth tables: inversion, NAND and NOR
   - Logic circuits: CMOS logic gates; flip-flops, registers, counters, adder

4. **Relationship of course to program objectives**: This course strengthens students’ application of fundamental knowledge of mathematics, science and engineering. Students learn to apply modern skills, techniques and engineering tools. Students achieve an understanding of the conceptual foundations of circuits and emerging applications.

5. **Prepared by**: Connie Chang-Hasnain (4/1/06)