

1. **Number and title of course:** EE 100, Electronic Techniques for Engineering
2. **Course objectives:** EE 42/100 (and EE 43) serve as an introduction to the principles of Electrical Engineering, using electronic devices to communicate, solve problems, and manipulate our environment. EE 42/100 will begin with basic concepts, develop analysis methods for circuits, understand how design concepts are realized, and study some high level applications including logic circuits, amplifiers, filters, and communication links.
3. **Topics covered:**
 - Circuits, currents, and voltages; Power and energy; Kirchhoff's Current Law; Kirchhoff's Voltage Law
 - Resistive circuits; Thévenin and Norton equivalent circuits; Node/Mesh/Superposition analysis; Introduction to SPICE
 - Inductance and capacitance; Transient circuit analysis
 - Phasors; Frequency response; Bode plots; Resonance
 - 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
 - Semiconductors, doping, holes and electrons; Basic concepts in fabrication – lithography, etch, deposition, testing
 - Diodes: Basic concepts; Load-line analysis of diode circuits; Ideal-diode model; Piecewise-linear diode models; Rectifier circuits
 - Amplifiers: Basic amplifier concepts; Cascaded amplifiers; Ideal amplifiers; Frequency response
 - MOSFET: NMOS and PMOS transistors; Load-line analysis of a simple NMOS amplifier; Bias circuits; Small-signal equivalent circuits
 - Logic circuits: CMOS logic gates; Flip-flops, registers, counters, adder, memories, bus controllers
 - Communication systems: spectrum, modulation, multiplexing, error-correcting codes, lossy and lossless compression, public key cryptosystems
4. **Contribution of course meeting the professional component:** (To be determined by the Undergraduate Study Committee)
5. **Relationship of course to program outcomes:**
 - a) Students are expected to apply basic principles of mathematics such as derivatives and integration to understanding transient responses. A low-level understanding of electricity is facilitated by using water flow/pressure analogies. Using these tools, students can analyze simple circuits such as MOSFET common source amplifier and CMOS inverter.
 - b) In lab, students follow standard lab exercises, but do need to be able to interpret their measurements in terms of their understanding of operational principles.
 - c) It is unlikely that most students would be able to design a system, component, or process after completing EE100. However, they would know that such circuits can be designed, and understand their basic principles of operation.
 - d) By learning basic EE principles, engineers in other fields will be better able to communicate needs when working in multidisciplinary teams with EE's.

- e) Students learn how to apply circuit analysis techniques such as KCL and KVL, as well as how to include dependent sources in circuits to model active components such as MOSFETs and op-amps.
 - f) Ethics is briefly mentioned in terms of safety when working with electricity, and what dangerous voltage/current levels are. In terms of basic circuit analysis, there has not been much ethical connection made.
 - g) To motivate students, contemporary technological issues are used as examples at various points through the semester. Specific examples from Spring 2009 were LED driver circuits and switching amplifiers. Students were presented with a contemporary switching amplifier schematic and shown how to understand the function of all the component circuits.
 - h) In the lab students learn to use oscilloscope, function generator, power supply, and typical analog and digital components. Lab exercises also introduce students to schematic entry and Spice simulation tools.
5. **Prepared by:** Kameshwar Poolla (Spring/2009)