Topics
Semiconductor physics, Electrons in crystals, band structures density of states, Fermi-Dirac distribution, intrinsic semiconductor, energy gap, effective mass, intrinsic carrier concentrations, donors and acceptors, carrier drift, diffusion, continuity equation, carrier recombination, high field effects, p-n junctions, energy-band diagrams, junction potential, depletion width, p-n junctions with bias, I-V characteristics for p-n junction, reverse breakdown and junction capacitance, SPICE models for p-n junctions, solar cell, LED, photo diodes, and laser diodes, Schottky barrier devices, Bipolar transistors, common-base and common emitter configurations, Ebers-Moll model, small signal models, SPICE models, band structure modification by alloys, heterostructures, and strain, phonons, mobility, transport in heterostructures, HBTs, Junction- Field Effect transistors (JFETS), JFET modeling, metal-semiconductor junctions, MESFETs, MOS capacitors, charge coupled devices, MOSFETS, I-V characteristics of MOSFETs, SPICE models, small signal AC model, subthreshold current behavior, MOSFET miniaturization, noise parameters, PSPICE MOSFET model parameters.

Homework, Projects, and Research papers:
Homework and Projects must be turned in when due; late homework and projects are not accepted. Although makeups are discouraged, it is possible to makeup an exam due to sickness, but only one makeup is allowed per semester. Each student will be required to write a research paper on the topics related to the course materials and will be due on the last day of the semester. Topics for the research papers will be discussed in the class.

Grades:
Typical Grade weighting:
Exams 400 points, Homework 100 points, Projects 100 points, and research paper 100 points.
Grading Scale:
A(>90%), B+(86 to 89%), B(80 to 85%), C+(76 to 79%), C(70 to 75%), D(60 to 69%), F(<60%)

References:
Daniel Foty, MOSFET Modeling with SPICE, Prentice Hall, 1997
Ian Getreu, Modeling the Bipolar Transistor, Tektronix Inc., 1976,