King Saud University  
College of Engineering  
Electrical Engineering Department  

Second Semester 1429/1430 H  
EE311 - Basics of Semiconductor Devices  

Instructor:  
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Text Book:  

Grading Policy: Grades will be distributed as follows;  

- Two in-term exams  
  - First Exam  Thursday 12:30 pm  20/4/1430 H (16/4/2009 G)  20%  
  - Second Exam  Thursday 12:30 pm  11/6/1430 H (4/6/2009 G)  20%  

- Class/Home work  10%  
- Drop Quizzes  10%  
- Final Exam (covers the entire course content)  40%  

Total Grade  100%  

A student will not be given a make-up exam unless he presents an official excuse.  

Attendance:  
A student with an absence rate of 25% or greater by the last day of classes will not be allowed to attend the final exam. Tutorials will be included in the absence rate.  

Course Contents:  

- Introduction  
  - Semiconductors: how different from metals and insulators  
  - Intrinsic, N-type, and P-type Semiconductors  
  - Generation, Recombination, and Energy band model  
  - Conductivity and resistivity  
  - Current mechanisms: diffusion and drift currents  

- P-N Junction Diodes  
  - Physical Operation of Diodes  
  - Terminal (I-V) characteristics of Junction Diodes  
  - The Ideal Diode and Constant-Voltage Models  
  - Diode Applications: Logic gates, Rectifiers, Photodiodes, Solar Cells, LEDs, Zener, and Laser Diodes.  
  - Analysis of Diode Circuits  
  - The Small-Signal Model and its Application
• Metal-Oxide Semiconductor Field-Effect Transistors (MOSFETs)
  - Introduction: MOSFET and the Digital World
  - The Enhancement-Type MOSFET (E-MOSFET): Device Structure and Physical Operation
  - Current-Voltage Characteristics for E-MOSFET
  - The Depletion-Type MOSFET (D-MOSFET): Device Structure and Physical Operation
  - Current-Voltage Characteristics for D-MOSFET
  - MOSFET Circuits at DC
  - The MOSFET as an Amplifier and as a Switch
  - Small-Signal Operation and Models
  - The NMOS and CMOS Digital Logic Inverters

• Bipolar Junction Transistors
  - Physical Structures Modes of Operation, and Types
  - Graphical Representation of Transistor Characteristics
  - Analysis of Transistor Circuits at DC
  - The Transistor as an Amplifier
  - Small-Signal Equivalent Circuit Models
  - Graphical Analysis
  - The Transistor as a Switch