

King Saud University
College of Engineering
Electrical Engineering Department

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

10/3/1430 H (7/3/2009 G)
Section # 16884

Instructor: **Dr. Abdulhameed Y. Almazroo**
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الدكتور عبدالحميد بن يوسف المزروع

Text Book: Microelectronic Circuit Design, by Jaeger/ Blalock, 3rd edition 2008, McGraw- Hill.

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