King Saud University
College of Engineering
Electrical Engineering Department

EE310 – Microelectronic Devices and Circuits
3 credit hours

Second Semester (Spring) 1436/2015

Instructor:
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Class time: – Sunday, Tuesday & Thursday 10:00-10:50 am, Room 1C5.

Office hours: Tuesday 1:30-3:00pm, Room location: PSATRI; Phone #: 4695132

Reference Text:
Sedra/Smith, Microelectronic Circuits, 5th edition 2004, Oxford University Press.

Other reference Texts:
Thomas Floyd, Electronic Devices, 9th edition 2012, Prentice Hall.
Kasap, Principles of Electrical Engineering Materials and Devices, 9th edition 2006, McGraw Hill.

Course Requirements:

20%	Midterm Exam I
20%	Midterm Exam II
10%	Quizzes
10%	Homework Assignments
40%	Final Exam (Comprehensive)

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

List of Topics:

Introduction to semiconductors
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 (BJTs)

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