

Electronics Devices and Circuits

Course Objectives:

- 1.To introduce the fundamentals of analysis of electronic circuits
- 2.To provide basic understanding of semiconductor devices and analog integrated circuits

1.Diodes(5 hours)

- a.The Ideal Diode
- b.Terminal Characteristics of Junction Diodes
- c.Physical Operation of Diodes
- d.Analysis of Diode Circuits
- e.Small Signal Model and Its Application
- f.Operation in the Reverse Breakdown Region–Zener Diodes

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2.The Bipolar Junction Transistor(10 hours)

- a.Operation of the npn transistor in the Active Mode
- b.Graphical Representation of Transistor Characteristics
- c.Analysis of Transistor Circuits at DC
- d.Transistor as an Amplifier
- e.Small Signal Equivalent Circuit Models
- f.Graphical Load Line Analysis
- g.Biasing BJT for Discrete–Circuit Design
- h.Basic Single–Stage BJT Amplifier Configurations (C–B, C–E, C–C)
- i.Transistor as a Switch–Cut off and Saturation
- j.A General Large–Signal Model for the BJT: The Ebers–Moll Model

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3.Field–Effect Transistor(9 hours)

- a.Structure and Physical Operation of Enhancement–Type MOSFET
- b.Current–Voltage Characteristics of Enhancement–Type MOSFET
- c.The Depletion–Type MOSFET
- d.MOSFET Circuits at DC
- e.MOSFET as an Amplifier
- f.Biasing in MOS Amplifier Circuits
- g.Junction Field–Effect Transistor

4.Output Stages and Power Amplifiers(9 hours)

- a.Classification of Output Stages
- b.Class A Output Stage
- c.Class B Output Stage
- d.Class AB Output Stage
- e.Biasing the Class AB Stage
- f.Power BJTs
- g.Transformer–Coupled Push–Pull Stages*
- h.Tuned Amplifiers

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5.Signal Generator and Waveform–Shaping Circuits(6 hours)

- a.Basic Principles of Sinusoidal Oscillator
- b.Op Amp–RC Oscillator Circuits
- c.LC and Crystal Oscillators
- d.Generation of Square and Triangular Waveforms Using Astable Multivibrators
- e.Integrated Circuit Timers
- f.Precision Rectifier Circuits

6. EPower Supplies, Breakdown Diodes, and Voltage Regulators(6 hours)
 - a.Unregulated Power Supply
 - b.Bandgap Voltage Reference, A Constant Current Diodes
 - c.Transistor Series Regulators
 - d.Improving Regulator Performance
 - e.Current Limiting
 - f.Integrated Circuit Voltage Regulator

References:

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- 3.Robert Boylestad and Louis Nashelsky, " Electronic Device and Circuit Theory", PHI; 9th Edition, 2007
- 4.Thomas L. Floyd, "Electronic Devices", 8th Edition, Pearson Education Inc., 2007
- 5.Mark N. Horenstein, "Microelectronic Circuits and Devices", PHI; 2nd Edition, 1997
- 6.Paul Horowitz and Winfield Fill, "The Art of Electornics", Cambridge Publication; 2 Edition
- 7.Jacob Millman and Christos C. Halkias,and Satyabrata Jit "Millman's Electronic Device and Circuits", Tata McGraw- Hill; 2nd Edition, 2007