EC/EE-202 **ELECTRONIC DEVICES AND CIRCUITS** **L T P C**
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COURSE OBJECTIVES:

1. To understand semiconductor basics like semiconductor material, its types, concepts of Drift current, diffusion current.
2. To understand the principle of operation and characteristics of Diode, Tunnel Diode and Rectifiers.
3. To understand the principle of operation and characteristics of BiPolar Junction Transistor.
4. To analyze the transistor biasing and thermal stabilization of transistor, operation and characteristics of JFET.
5. To understand the principle of operation and characteristics of MOSFET.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand PN junction diode current components and characteristics, Zener diode and its electrical characteristics, Rectifiers and capacitor filters, Working and characteristics of BJT, JFET, MOS capacitor and MOSFET.
2. Analyze the rectifiers, filters and transistor biasing circuits for the given set of specifications.
3. design biasing techniques such as fixed bias, collector to base bias and self-bias for the given specifications.
4. solve numerical and analytical problems in PN junction diode, Zener diode voltage regulator, rectifiers, filters, BJT, JFET and MOSFET.
5. select the appropriate mode of operation for modeling the behavior of PN junction diode, Zener diode, BJT, JFET, and MOSFET.

UNIT I *Text Book-1* **(12)**

PN JUNCTION: Basic Structure of the PN Junction, Zero applied Bias, Reverse applied Bias, Non-Uniformly Doped Junctions, PN Junction Current, Generation-Recombination Currents, Junction Break Down, Zener diode as voltage regulator, Capacitances of The Diode. The Tunnel Diode.

UNIT II *Text Book-1* **(12)**

BIPOLAR TRANSISTOR: The Bipolar Transistor Action, Minority Carrier Distribution, Low-Frequency Common-Base Current Gain, Nonideal Effects. Equivalent Circuit Models - Hybrid-Pi Model, Frequency limitations.

UNIT III *Text Book-2* **(12)**

TRANSISTOR CHARACTERISTICS: Common Emitter, Common Base and Common Collector Characteristics, Photo Transistor.

TRANSISTOR BIASING: The Operating Point, Bias Stability, Biasing Techniques, Stabilization against variations in I_{CO}, V_{BE}, β, Thermal Runaway.

UNIT IV *Text Book-1* **(12)**

METAL-OXIDE-SEMICONDUCTOR FIELD-EFFECT TRANSISTOR: The Two Terminal MOS Structure, Capacitance-Voltage Characteristics, The Basic MOSFET Operation, Frequency limitations, Non-ideal Effects.

UNIT V *Text Book-1 , 2* **(12)**

JUNCTION FIELD-EFFECT TRANSISTOR: JFET Concepts, The Device Characteristics, Non-ideal Effects, Equivalent Circuit and Frequency limitations.

RECTIFIERS: Half wave Rectifier and Full wave Rectifier with Capacitor filter.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Donald A. Neamen - Semiconductor Physics and Devices, 3rd Edition, TMH, 2003.
2. Jacob Millman and Christos C. Halkias - Integrated Electronics, TMH, 1972.

REFERENCE BOOK(s):

Ben G Streetman and Sanjay Banerjee, Solid State Electronic Devices, 5th Edition,2000

WEB RESOURCES:

1. http://nptel.iitm.ac.in/courses/
2. http://www.deas.harvard.edu/courses/es154/