

## ELECTRONIC DEVICES AND CIRCUITS

<b>III Semester: ECE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>AECEB06</b>	<b>CORE</b>	L	T	P	C	CIA	SEE	Total
		3	1	0	4	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: 15</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	

### **COURSE OBJECTIVES:**

**The course should enable the students to:**

- I. Introduce components such as diodes, BJTs and FETs.
- II. Know the applications of components.
- III. Know the switching characteristics of components.
- IV. Give understanding of various types of amplifier circuits.

### **COURSE OUTCOMES (COs):**

CO 1: Describe diode operation, transition capacitance, diffusion capacitance and the use of diode in various electronic circuits.

CO 2: Understand the principle of operation of BJT in CE, CB, and CC configuration and analyze transistor hybrid model.

CO 3: Bias the transistors and analyze the low frequency response of BJT amplifiers

CO 4: Study and analyze the behavior of FET and MOSFET.

CO 5: Analyze FET amplifiers in CS,CG,CD modes using small signal model and study the behaviour of special purpose diodes.

### **COURSE LEARNING OUTCOMES (CLOs):**

1. Understand and analyze diodes operation and static and dynamic resistance in order to design basic circuits.
2. Understand diffusion and transition capacitance of diode in forward and reverse bias conditions.
3. Understand and analyze diode applications and how the diode acts as a switch.
4. Design rectifier without and with capacitive filters for the given specifications.
5. Understand the use of diodes in typical circuits like, clipping, clamping circuits and comparator circuits.
6. Understand the principle of operation and characteristics of common emitter, common base and common collector configurations.
7. Understand the concept of operating point, DC & AC load lines.
8. Analyze transistor hybrid parameter model for CE, CB and CC configurations.
9. Determine of h-parameters of BJT amplifier from transistor characteristics.
10. Understand the use of conversion of h-parameters among CE, CB and CC configurations.
11. Identify the various transistor biasing circuits, compensation circuits and its usage in applications like amplifiers.
12. Analyze various transistor configurations and assess merits and demerits for different applications.
13. Analyze CE Amplifier with emitter resistance.
14. Analyze low frequency response of BJT Amplifiers.
15. Understand the effect of coupling and bypass capacitors on CE Amplifier
16. Explain construction and principle of operation of JFET

17. Understand the concept of pinch-off voltage and volt-ampere characteristic of JFET 18. Distinguish the constructional features and operation of BJT and FET and their applications 19. Understand biasing of FET and how it acts as voltage variable resistor 20. Discuss the construction of MOSFET and steady the VI characteristics, as it is the prime component in VLSI technology 21. Apply small-signal models to field effect transistors and determine the voltage gain and input and output impedances 22. Analyzes CS, CD, CG JFET amplifiers using small signal model 23. Understand basic concepts of MOSFET amplifiers 24. Explain the operation of Zener diode and its usage in voltage regulating application 25. Understand the principle of operation and characteristics of silicon controlled rectifier, tunnel diode, UJT and varactor diode		
<b>MODULE - I</b>	<b>DIODE AND APPLICATIONS</b>	<b>Classes: 08</b>
Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times. Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers With Capacitive Filter, Clippers-Clipping at two independent levels, Clampers-Clamping Operation, types, Clamping Circuit Theorem, Comparators.		
<b>MODULE - II</b>	<b>BIPOLAR JUNCTION TRANSISTOR (BJT)</b>	<b>Classes: 10</b>
Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.		
<b>MODULE - III</b>	<b>TRANSISTOR BIASING AND STABILIZATION</b>	<b>Classes: 10</b>
Bias Stability, Fixed Bias, Collector to Base bias, Self Bias, Bias Compensation using Diodes and Transistors. <b>Analysis and Design of Small Signal Low Frequency BJT Amplifiers:</b> Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.		
<b>MODULE - IV</b>	<b>JUNCTION FIELD EFFECT TRANSISTOR</b>	<b>Classes: 08</b>
Construction, Principle of Operation, Pinch-Off Voltage, Volt- Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor, MOSFET Construction and its Characteristics in Enhancement and Depletion modes.		
<b>MODULE - V</b>	<b>FET AMPLIFIERS</b>	<b>Classes: 09</b>
Small Signal Model, Analysis of CS, CD, CG JFET Amplifiers. Basic Concepts of MOSFET Amplifiers. <b>Special Purpose Devices:</b> Zener Diode - Characteristics, Voltage Regulator; Principle of Operation - SCR, Tunnel diode, UJT, VaractorDiode.		
<b>Text Books:</b>		
1. Electronic Devices and Circuits - Jacob Millman, McGraw Hill Education. 2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11 <sup>th</sup> Edition, Pearson, 2009.		

**Reference Books:**

1. The Art of Electronics , Horowitz, 3rdEdition Cambridge University Press,2018
2. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 Ed., McGraw Hill,2008.
4. Electronic Devices and Circuits, S. Salivahanan, N.Suresh Kumar, A Vallvaraj, 2<sup>nd</sup> Edition, TMH.

**Web References:**

1. <http://www-mdp.eng.cam.ac.uk/web/library/enginfo/electrical/hong1.pdf>
2. <https://archive.org/details/ElectronicDevicesCircuits>
3. [http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASICELECTRONICS/home\\_page.htm](http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASICELECTRONICS/home_page.htm)
4. <http://www.vidyarthiplus.in/2011/11/electronic-device-and-circuits-edc.html>
5. <http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html>

**E-Text Books:**

1. <http://services.eng.uts.edu.au/pmcl/ec/Downloads/LectureNotes.pdf>
2. <http://nptel.ac.in/courses/122106025/>
3. [http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-\(PDF-313p\).html](http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-(PDF-313p).html)
4. <https://www.jntubook.com/electronic-device-circuits-textbook-free-download/>
5. [http://www.faadooengineers.com/threads/32735-Electronic-Devices-And-Circuits-\(EDC\)-by-J-B-Gupta-full-book-pdf](http://www.faadooengineers.com/threads/32735-Electronic-Devices-And-Circuits-(EDC)-by-J-B-Gupta-full-book-pdf)