

## ELECTRONIC DEVICES AND CIRCUITS

III Semester: ECE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AECB06	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			

**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 LEARNING OUTCOMES (CLOs):**

1. Understand and analyze diodes operation and their characteristics in order to design basic form circuits.
2. Explain the operation of Zener diode and its usage in voltage regulating application.
3. Explain the operational characteristics of various special purpose diodes such as zener diode, Tunnel diode, varactor diode and photo diode and unijunction transistor.
4. Understand the principle of operation and characteristics of silicon controlled rectifier and its application in power supply protection circuit.
5. Explain half wave rectifier without and with different filters for the given specifications.
6. Design full wave rectifier without filter and different filters for the given specifications.
7. Design and selection of appropriate filter to meet the requirements of voltage regulation and ripple factor.
8. Write Use of diodes in typical circuits: rectifiers, regulated power supplies, limiting circuits.
9. Understand the different parameters of transistors such as depletion width and channel width for understanding the functioning and design of this component.
10. Apply small-signal models to field effect transistors and determine the voltage gain and input and output impedances.
11. Analyze various transistor configurations and asses merits and demerits for different applications.
12. Discuss the construction of MOSFET and steady the VI characteristics, as it is the prime component in VLSI technology.
13. Distinguish the constructional features and operation of FET and MOSFET and their applications.
14. Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis.
15. Identify the various transistor biasing circuits and its usage in applications like amplifiers.
16. Explain basic circuits like dc and biasing circuits, small-signal ac circuits with emphasis on single-stage amplifiers.
17. Explain the role of temperature variations on the performance of the BJT, FET and MOSFET in order to take necessary measures in design for stabilization.
18. Discuss and Design small signal amplifier circuits applying the various biasing techniques.
19. Apply small-signal models to transistors and determine the voltage gain and input and output impedances.
20. Analyze the performance of FETs on the basis of their operation and working.
21. Apply the concept of electronic devices and circuits to understand and analyze real time applications.
22. Acquire the knowledge and develop capability to succeed national and international level competitive examinations.

<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.		
Analysis and Design of Small Signal Low Frequency BJT Amplifiers: 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. Special Purpose Devices: Zener Diode - Characteristics, Voltage Regulator; Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.		
<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, 11th Edition, Pearson, 2009.		
<b>Reference Books:</b>		
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, 2nd Edition, TMH.		
<b>Web References:</b>		
1. <a href="http://www-mdp.eng.cam.ac.uk/web/library/enginfo/electrical/hong1.pdf">http://www-mdp.eng.cam.ac.uk/web/library/enginfo/electrical/hong1.pdf</a> 2. <a href="https://archive.org/details/ElectronicDevicesCircuits">https://archive.org/details/ElectronicDevicesCircuits</a> 3. <a href="http://nptel.ac.in/courses/Webcourse-contents/IIT-roorkee/basic electronics/home_page.htm">http://nptel.ac.in/courses/Webcourse-contents/IIT-roorkee/basic electronics/home_page.htm</a> 4. <a href="http://www.vidyarthiplus.in/2011/11/electronic-device-and-circuits-edc.html">http://www.vidyarthiplus.in/2011/11/electronic-device-and-circuits-edc.html</a> 5. <a href="http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html">http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html</a>		
<b>E-Text Books:</b>		
1. <a href="http://services.eng.uts.edu.au/pmcl/ec/Downloads/LectureNotes.pdf">http://services.eng.uts.edu.au/pmcl/ec/Downloads/LectureNotes.pdf</a> 2. <a href="http://nptel.ac.in/courses/122106025/">http://nptel.ac.in/courses/122106025/</a> 3. <a href="http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-(PDF313p).html">http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-(PDF313p).html</a> 4. <a href="https://www.jntubook.com/electronic-device-circuits-textbook-free-download/">https://www.jntubook.com/electronic-device-circuits-textbook-free-download/</a> 5. <a href="http://www.faadooengineers.com/threads/32735-Electronic-Devices-And-Circuits-(EDC)-by-J-BGupta-full-book-pdf">http://www.faadooengineers.com/threads/32735-Electronic-Devices-And-Circuits-(EDC)-by-J-BGupta-full-book-pdf</a>		