

## ELECTRONIC DEVICES AND CIRCUITS

<b>III Semester: ECE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEC001	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: 15</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	
<b>I. COURSE OVERVIEW:</b>								
<p>The course provides the constructional features and principle of operation of the basic semiconductor devices such as diodes, bipolar and unipolar transistors. It intended to provide the different biasing configurations of the semiconductor devices to provide temperature stability. Analytical skills to configure semiconductor devices for the applications - rectifiers, clippers, voltage regulators, clampers and amplifiers.</p>								
<b>II. OBJECTIVES:</b>								
<b>The course should enable the students to:</b>								
<p>I The operational principles, characteristics of semiconductor devices and circuits for rectification, amplification, conditioning and voltage regularization of signals.</p> <p>II The analytical skills needed to model analog and digital integrated circuits (IC) at discrete and micro circuit level.</p> <p>III The foundations of basic electronic circuits necessary for building complex electronic hardware.</p>								
<b>III. COURSE OUTCOMES:</b>								
<b>After successful completion of the course, students should be able to:</b>								
CO 1	Illustrate the characteristics of semiconductor devices for determining the device parameters such as resistances, current gain and voltage gain.						Understand	
CO 2	Apply the p-n junction characteristics for the diode applications such as switch and rectifiers.						Apply	
CO 3	Examine DC and AC load line analysis of BJT and FET amplifiers for optimal operating level regardless of input, load placed on the device.						Analyze	
CO 4	Extend the biasing techniques for bipolar and uni-polar transistor amplifier circuits considering stability condition for establishing a proper operating point.						Understand	
CO 5	Utilize low frequency model for estimation of the characteristic parameters of BJT, FET amplifier circuits.						Apply	
CO 6	Demonstrate the working principle of special purpose semiconductor diodes and transistors for triggering and voltage regulation applications.						Understand	
<b>IV. SYLLABUS:</b>								
<b>UNIT-I</b>	<b>SEMICONDUCTOR DIODES</b>						<b>Classes: 08</b>	
<p>PN Junction Diode : Theory of PN diode, energy band diagram of PN diode, PN junction as a diode, operation and V-I characteristics , static and dynamic resistances, diode equivalent circuits, diffusion and transition capacitance, diode current equation, temperature dependence of V-I characteristics, Zener diode characteristics ,break down mechanisms in semiconductor diodes, Zener diode as a voltage regulator.</p>								
<b>UNIT-II</b>	<b>SPECIAL PURPOSE ELECTRONIC DEVICES AND RECTIFIERS</b>						<b>Classes: 10</b>	
<p>Special purpose electronic devices: principles of operation and characteristics of silicon controlled rectifier, tunnel diode, varactor diode, photodiode; Half wave rectifier, full wave rectifier, general filter consideration, harmonic components in a rectifier circuit , Inductor Filter, capacitor filter, L-Section filter, multiple L-C section, RC filter, comparison of filters.</p>								

<b>UNIT-III</b>	<b>TRANSISTORS</b>	<b>Classes: 08</b>
<p>Bipolar Junction Transistors: Construction of BJT, operation of BJT, minority carrier distributions and current components, configurations, characteristics, BJT specifications; Applications: Amplifier, switch.</p> <p>Field Effect Transistors: Types of FET, FET construction, symbol, principle of operation, V-I characteristics, FET parameters, FET as voltage variable resistor, comparison of BJT and FET; MOSFET construction and operation; Uni-Junction Transistor: Symbol, principle of operation, characteristics, applications (UJT as relaxation oscillator).</p>		
<b>UNIT-IV</b>	<b>BIASING AND COMPENSATION TECHNIQUES</b>	<b>Classes: 10</b>
<p>Need for biasing, BJT operating point, The DC and AC load lines, types of biasing circuits, bias stability, stabilization factors, stabilization against variations in <math>V_{BE}</math> and <math>\beta</math>; Bias compensation techniques, thermal runaway, thermal stability, biasing the FET and MOSFET.</p>		
<b>UNIT-V</b>	<b>BJT AND FET AMPLIFIERS</b>	<b>Classes: 09</b>
<p>BJT small signal analysis, BJT hybrid model, determination of h-parameters from transistor characteristics, transistor amplifiers analysis using h- parameters; FET small signal model, FET as common source amplifier, FET as common drain amplifier, FET as common gate amplifier, generalized FET amplifier .</p>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. J. Millman, C.C.Halkias, “Millman’s Integrated Electronics”, Tata McGraw-Hill, 2<sup>nd</sup> Edition, 2001.</li> <li>2. J. Millman, C.C.Halkias, Satyabrata Jit, “Millman’s Electronic Devices and Circuits”, Tata McGrawHill, 2<sup>nd</sup> Edition, 1998.</li> <li>3. David A. Bell, “Electronic Devices and Circuits”, Oxford University Press ,5<sup>th</sup> Edition,2008.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Sedha.R.S, “A Text Book of Applied Electronics”, Sultan Chand Publishers,1<sup>st</sup> Edition, 2008.</li> <li>2. R.L. Boylestad, Louis Nashelsky, “Electronic Devices and Circuits”, PEI/PHI, 9<sup>th</sup> edition, 2006.</li> <li>3. Gupta.J.B, “Electron Devices and Circuits”, S.K.Kataria &amp; Sons, 2<sup>nd</sup> Edition, 2012.</li> <li>4. S. Salivahanan, N. Suresh Kumar,A. Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw Hill, 2<sup>nd</sup> edition, 2011.</li> <li>5. Anil K. Maini, Varsha Agarwal, “Electronic Devices and Circuits”, Wiley India Pvt. Ltd, 1<sup>st</sup> edition, 2009.</li> <li>6. Floyd, “Electron Devices” Pearson Asia, 5<sup>th</sup> Edition, 2001.</li> <li>7. Mohammad Rashid, “Electronic Devices and Circuits”, Cengage learning ,1<sup>st</sup> Edition, 2014.</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>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></li> <li>2. <a href="https://archive.org/details/ElectronicDevicesCircuits">https://archive.org/details/ElectronicDevicesCircuits</a></li> <li>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></li> <li>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></li> <li>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></li> </ol>		

**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)

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