

<b>Course Title</b>	<b>Electronic Devices and Circuits-I</b>	
<b>Course Code</b>	<b>EC304</b>	
<b>Course Credit</b>	Theory	: 03
	Practical	: 02
	Tutorial	: 00
	Credits	: 05
<b>Course Learning Outcomes</b>		
<p>After completion of the course students will be able to:</p> <ol style="list-style-type: none"> <li>1. <b>Understand</b> the internal structure and performance of semiconductor devices</li> <li>2. <b>Understand</b> the basic electronics engineering principles</li> <li>3. <b>Design</b> and <b>Perform</b> experimental analysis of various electronic circuits</li> <li>4. <b>Compare</b> mathematical representations of circuit behavior with corresponding practical effects</li> <li>5. <b>Develop</b> proficiency in simulation of basic electronics circuits using simulation tools in Laboratory and <b>verify</b> the same on hardware</li> </ol>		
<b>Detailed Syllabus</b>		
<b>Sr. No.</b>	<b>Name of chapter &amp; details</b>	<b>Hours Allotted</b>
<b>Section – I</b>		
<b>1</b>	<b>Transport Phenomena in Semiconductors</b> Mobility and Conductivity, Electrons and Holes in an Intrinsic Semiconductor, Donor and Acceptor Impurities, Charge Densities in a Semiconductor, Electrical Properties of Ge and Si, The Hall Effect, Conductivity Modulation, Generation and Recombination of Charges, Diffusion, The Continuity Equation	<b>06</b>
<b>2</b>	<b>Junction –Diode Characteristics</b> Open –Circuited p-n Junction, p-n Junction as a Rectifier, Volt-Ampere Characteristic, Temperature Dependence of the V/I Characteristic, Diode Resistance, Space Charge, Transition Capacitance, Diffusion Capacitance , Junction Diode Switching Times, Breakdown Diodes, Tunnel Diode, Semiconductor Photodiode, Photovoltaic Effect, Light –Emitting Diodes	<b>06</b>

<b>3</b>	<b>Diode Circuits</b>  Diode as a Circuit Element, Load-Line Concept, Piecewise Linear Diode Model, Clipping Circuits, Clipping at Two Independent Levels, Comparators, Rectifiers, Other Full-Wave Circuits, Capacitor Filters	<b>05</b>
<b>4</b>	<b>Power Circuits and Systems</b>  Class A large Signal Amplifiers, Second Harmonic Distortion, Transformer Coupled Audio Power Amplifier, Efficiency, Push-Pull Amplifiers, Class B Amplifiers, Class AB Operation, Regulated Power Supplies	<b>04</b>
<b>Section – II</b>		
<b>5</b>	<b>Transistor Characteristics</b>  Junction Transistor, Transistor Current Components, Transistor as an Amplifier, Transistor Construction, CB Configuration, CE Configuration, CE Cut-off region, CE Saturation Region, Typical Transistor, CE Current Gain, CC Configuration, Phototransistor	<b>08</b>
<b>6</b>	<b>Transistor Biasing and Thermal Stabilization</b>  Operating Point, Bias Stability, Self-Bias , Stabilization against Variations in $I_{CO}$ , $V_{BE}$ and, General Remarks on Collector-Current Stability, Bias Compensation, Thermal Runaway, Thermal Stability	<b>06</b>
<b>7</b>	<b>Transistor at Low Frequencies</b>  Graphical Analysis of the CE configuration, Two-Port Devices and the Hybrid Model, Transistor Hybrid Model, h-Parameters, Conversion Formulas for the Parameters of Three Transistor Configurations, Analysis of a Transistor Amplifier Circuit Using h Parameters, Emitter Follower, Comparison of Transistor Amplifier Configurations, Linear Analysis of a Transistor Circuit, Miller's Theorem and its Dual, Simplified CE Hybrid Model, Simplified Calculations for the CC Configuration, CE amplifier with an Emitter Resistance, High Input Resistance Transistor Circuits	<b>04</b>
<b>8</b>	<b>Field Effect Transistors</b>  Junction FET, Pinch-Off Voltage, JFET Volt-Ampere Characteristics, FET Small-Signal Model, MOSFET, Digital MOSFET Circuits, Low Frequency CS and CD Amplifiers, Biasing the FET, The FET as a Voltage Variable Resistor.	<b>03</b>

**Instructional Method and Pedagogy:**

- Lectures will be conducted with the aid of multi-media projector, blackboard, OHP etc. Assignments based on course contents will be given to the students at the end of each unit/topic and will be evaluated at regular interval
- Minimum ten experiments shall be there in the laboratory related to course contents

**List of Experiments:**

1. To perform the various functions & controls of C.R.O.
2. To perform V-I characteristics of Diode.
3. To analyze the V-I characteristics of Zener diode.
4. To analyze the V-I characteristics of LED.
5. To analyze the V-I characteristics of photo diode.
6. To analyze the V-I characteristics of photo transistor.
7. To design and perform clipper circuit and analyze the output waveform.
8. To demonstrate the importance of simulation tools.
9. To design simulation model of clipper circuit and analyze.
10. To design and perform comparator circuit and analyze the output waveform.
11. To design and perform clamper circuit and analyze the output waveform.
12. To design and perform half wave rectifier circuit and calculate the efficiency.
13. To design simulation model of half wave rectifier circuit and analyze
14. To design and perform full wave rectifier (center tap and bridge) circuits and calculate the efficiency.
15. To design simulation model of full wave rectifier (center tap and bridge) circuits and analyze
16. To analyze and perform CE configuration transistor input output characteristics.
17. To analyze and perform CB configuration transistor input output characteristics.
18. To analyze and perform CC configuration transistor input output characteristics.
19. To demonstrate and perform transistor as an amplifier.
20. To perform characteristics of FET.
21. To perform characteristics of MOSFET.
22. To demonstrate and perform Class-A amplifier operation.
23. To demonstrate and perform Class-AB amplifier operation.
24. To design and perform Cascading Transistor Amplifiers and compare the gain factor with single stage amplifier.

**Reference Books:**

1. J. Millman, C. Halkias and C. Parikh, "Integrated Electronics", Tata McGraw Hill Publication, 2<sup>nd</sup> Ed, New Delhi
2. R. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson, 10<sup>th</sup> Ed, New Delhi
3. A. Malvino, "Electronics Principles", Tata McGraw Hill Publication, 6<sup>th</sup> Ed, New Delhi

**Additional Resources**

- <http://pveducation.org/pvcdrom/pn-junction/pn-junction-diodes>
- <http://www.electronics-tutorials.ws/>
- <http://www.engineersgarage.com/electronic-circuits>
- <http://www.eleccircuit.com/simple-electronic-circuits/>
- [http://www.nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC-ELECTRONICS/home\\_page.htm](http://www.nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC-ELECTRONICS/home_page.htm)