

ELECTRONIC DEVICES AND CIRCUITS

| 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 | | |

I. COURSE OVERVIEW:

This 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, clampersand amplifiers.

II. OBJECTIVES:

The course should enable the students to:

- I The operational principles, characteristics of semiconductor devices and circuits for rectification, amplification, conditioning and voltage regularization of signals.
- II The analytical skills needed to model analog and digital integrated circuits (IC) atdiscrete and micro circuit level.
- III The foundations of basic electronic circuits necessary for building complexelectronic hardware.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

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| 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 pan junction characteristics for the diode applications such as switch, rectifiers, Clippers and Clampers. | Apply |
| CO 3 Examine DC and AC load line analysis of BJT and FET amplifiers foroptimal operating level regardless of input, load placed on the device. | Analyze |
| CO 4 Extend the biasing techniques for bipolar and uni-polar transistoramplifier circuits considering stability condition for establishing a proper operating point. | Understand |
| CO 5 Utilize low frequency model for estimation of the characteristicparameters of BJT, FET amplifier circuits. | Apply |
| CO 6 Demonstrate the working principle of special purpose semiconductordiodes and transistors for triggering and voltage regulation applications. | Understand |

IV. SYLLABUS:

| MODULE - I | DIODE AND APPLICATIONS | Classes: 08 |
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| 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. | | |
| MODULE - II | BIPOLAR JUNCTION TRANSISTOR (BJT) | Classes: 10 |
| 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. | | |

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| MODULE - III | TRANSISTOR BIASING AND STABILIZATION | Classes: 10 |
| 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. | | |
| MODULE - IV | JUNCTION FIELD EFFECT TRANSISTOR | Classes: 08 |
| 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. | | |
| MODULE - V | FET AMPLIFIERS | Classes: 09 |
| 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. | | |
| Text Books: | | |
| <ol style="list-style-type: none"> 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. | | |
| Reference Books: | | |
| <ol style="list-style-type: none"> 1. The Art of Electronics , Horowitz, 3rd Edition 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. | | |
| Web References: | | |
| <ol style="list-style-type: none"> 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/BASIC ELECTRONICS/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: | | |
| <ol style="list-style-type: none"> 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 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 | | |