ELECTRONIC DEVICES AND CIRCUITS

III Semester: ECE / EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEC001	Core	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. Acquire knowledge of electrical characteristics of ideal and practical diodes under forward and reverse bias to analyze and design diode application circuits such as rectifiers and voltage regulators.
II. Utilize operational principles of bipolar junction transistors and field effect transistors to derive appropriate small-signal models and use them for the analysis of basic amplifier circuits.
III. Perform DC analysis (algebraically and graphically using current voltage curves with super imposed load line) and design of CB, CE and CC transistor circuits.
IV. Compare and contrast different biasing and compensation techniques and functioning as amplifier.

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.
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. Estimate the performance of BJT and UJT on the basis of their operation and working.
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 inorder 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.

Unit-I	SEMICONDUCTOR DIODES	Classes: 08
P-N Junction Diode: Qualitative Theory of P-N Junction, P-N Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of VI characteristic, Ideal versus Practical – Resistance levels (Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis, Breakdown Mechanisms in Semiconductor Diodes, Zener Diode Characteristics, Zener diode as a voltage regulator.		
Unit -II	**SPECIAL ELECTRONIC DEVICES AND RECTIFIERS**	**Classes: 10**
Special purpose electronic devices: Principles of operation and characteristics of Silicon controlled rectifier, tunnel diode, varavtor diode, Photo diode; Half wave Rectifier, Full wave Rectifier, general filter considerations, Harmonic components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L-Section Filters,multiplt of L-C section , RC filter, Comparison of Filters.		
Unit -III	**TRANSISTORS**	**Classes: 08**
Bipolar Junction Transistor and UJT: Transistor Construction, BJT Operation, minority carrier distribution and current components, Configurations, Characteristics, BJT specifications; Appications; Amplifier, switch. 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, UJT Characteristics and applications		
Unit -IV	**BIASING AND COMPENSATION TECHNIQUES**	**Classes: 10**
Biasing and Compensation techniques: Operating Point, The DC and AC Load lines, types of biasing circuits, Bias Stability, Stabilization Factors, Stabilization against variations in VBE and β, Bias Compensation techniques, Thermal Runaway, Thermal Stability, biasing the FET and MOSFET.		
Unit -V	**BJT AND FET AMPLIFIERS**	**Classes: 09**
BJT small signal analysis, BJT hybrid model, determination of h-parameters from transistor characteristics, Transistor amplifier, 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.		

Text Books:

1. J. Millman, C.C.Halkias and Satyabrata Jit, "Millman's Electronic Devices and Circuits", 2nd Edition, 1998, Tata McGraw Hill Publications.
2. J. Millman and Christos C. Halkias, "Integrated Electronics", International Student Edition , 2008, Tata McGraw Hill Publications.
3. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press.

Reference Books:

1. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits", 9th Edition, 2006, PEI/PHI.
2. B.P.Singh, Rekha Singh, "Electronic Devices and Circuits", 2nd Edition, 2013, Pearson Publisher.
3. K. Lal Kishore, "Electronic Devices and Circuits", 2nd Edition, 2005,BS Publisher.
4. Anil K. Maini and Varsha Agarwal, "Electronic Devices and Circuits", 1stEdition, 2009, Wiley India Pvt. Ltd.
5. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, "Electronic Devices and Circuits", 2nd Edition, 2011, Tata McGraw Hill Publications.

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/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:

1. 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-(PDF313p).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-BGupta-full-book-pdf