SILVER OAK UNIVERSITY

Silver Oak Institute of Science

Bachelor of Science Physics

Course Name: Basic Electronics-II

Course Code: 2050253105

Semester: 2nd

Prerequisite:

1. Fundamental understanding of basic electronic circuits and Boolean algebra concepts.

Course Objectives:

1. Understand the operation and configurations of NPN and PNP transistors, including CE configuration, breakdown phenomena, and the Ebers-Moll model, while also addressing bias stability and compensation methods for thermal run-away.
2. Analyze small-signal amplifiers using two-port network parameters, including Z, Y, and h parameters, and apply simplified CE hybrid models and Miller's theorem for the design and analysis of single-stage BJT amplifiers.
3. Master network theorems such as Thevenin's, Norton's, and maximum power transfer theorem, along with resonance circuit concepts including series and parallel resonance, bandwidth calculations, and the application of Q factor in circuit analysis.

Teaching Scheme:

Teaching Scheme				
L	T	P	Contact Hours	Credit
2	0	4	6	4

Contents:

Unit	Topics	Teaching Hours	% Weightage
1	**Bipolar junction Transistor** Operation of NPN transistor, Operation of PNP transistor, CE configuration, Breakdown in Transistor, EBSER-MOLL model, Bias stability, Thermal run away, Stability factor, Method of Transistor Biasing, Fixed Bias method, Emitter feedback bias, collector to Base bias, collector emitter feedback bias, Voltage divider bias, Bias compensation, Thermistor and bias compensation **Mid Band Analysis of small signal Amplifier** Two port devices and Network Parameters, Z, Y and h parameters, Hybrid model for two port network, Analysis of transistor amplifier circuits using h parameters, Simplified CE hybrid model, The ‘re ‘model of transistor, small signal analysis of single stage BJT amplifier, CE amplifier with unbypassed emitter resistance, CE amplifier with voltage divider bias, MILLER’s theorem and its dual, Design of single stage RC coupled amplifier using BJT	14	50

2	**Network Theorem and Resonance Circuit** Reduction of complicated network, conversion between T and π sections, bridge T network, the lattice network, superposition theorem, the reciprocity theorem, Thevenin's theorem, Norton theorem, maximum power transfer theorem, compensation theorem. Resonance: Definition of Q, the figure of merit, series resonance, Bandwidth of the series resonant circuit, parallel resonance or anti resonance, current in anti-resonant circuits, Bandwidth of anti-resonant **Boolean Algebra** Basic Laws of Boolean algebra, over view of logic circuit, DeMorgan's theorem, standard representation for Logical function, MINTERM and MAXTERM, Simplification of Boolean expression, Karnaugh Map simplification, simplification of SUM OF PRODUCT, Simplification of PODUCT OF SUM, Don't care condition, Quine-McCluskey method, Design procedure for combinational Logic circuit, Half Adder, Full adder, N bit parallel adder, Subtractor, N bit parallel subtractor	14	50

Course Outcomes:

Sr. No.	CO Statement	Unit
CO-1	Understand the principles and operation of bipolar junction transistors (NPN and PNP), various transistor configurations (CE, emitter feedback bias, voltage divider bias), and methods of transistor biasing and compensation.	1
CO-2	Analyze small signal amplifiers using mid-band analysis, including two-port devices, network parameters (Z, Y, h parameters), hybrid models, and design of RC-coupled amplifiers using BJT.	1
CO-3	Explore Boolean algebra laws, logic circuit representation, simplification techniques (Karnaugh maps, Quine-McCluskey method), and design procedures for combinational logic circuits (adders, subtractors).	2
CO-4	Gain hands-on experience through practical experiments, including verification of network theorems, analysis of RC filters, load characteristics of rectifiers, conversion of networks, and determination of transistor parameters.	2

Teaching & Learning Methodology:

1. Conceptual Learning
2. Design Thinking
3. Competency based Learning
4. Problem - based Learning

List of Experiments: **Total Hours: 56**

Sr. No.	Practical Name
1	To verify the Thevenin's theorem
2	RC high pass filter
3	RC low pass filter
4	To study load characteristics and ripple factor of a Bridge rectifier with and without 'C' filter
5	Conversion of a given network in to T- network and π- network
6	To verify the maximum transfer theorem
7	To determine 'h' parameters of a transistor (CE configuration)
8	To study the variation of current and voltage with temperature for CE configuration
9	To study the variation of current and voltage with temperature for CB configuration
10	Scientific Computing

Books Recommended: -

1. R. S. Sedha, A text book of electronic circuits S. Chand
2. Dennis Roddy and John Coolen, Electronic Communications (Fourth edition), Prentice Hall
3. of India.
4. Malvino and Leach, Digital Principles and Applications, McGraw-Hill
5. Moriss Mano, Digital Design, PHI
6. Floyd, Digital Fundamentals, Pearson

List of Open-Source Software/learning website:

1. http://silveroakuni.ac.in/video-lecture

CO-PO-PSO Matrix:

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO-1	3	2	2	2	2	2	2	1	1	1	1	2	2
CO-2	3	2	2	2	2	2	2	1	1	1	1	2	2
CO-3	3	2	2	2	2	2	2	1	1	1	1	2	2
CO-4	3	2	2	2	2	2	2	1	1	1	1	2	2