BVM ENGINEERING COLLEGE [AN AUTONOMOUS INSTITUTION]

2EC02: ELECTRONIC DEVICES AND CIRCUITS
CREDITS - 3 (LTP:3,0,0)

Course Objective:
To familiarize students with small signal low and high frequency analysis on BJT circuits, and also with MOSFET building Block, Power amplifiers, various feedback & oscillators, Op-amp various parameters and its application, Signal Generators and Waveform-Shaping Circuits its applications.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per week)			Credits	Assessment Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	
3	0	0	3	60	40	00	00	100

Course Content:

Unit No.	Topics	Teaching Hours
1.	**Small Signal Frequency Analysis And Design:** • **Low Frequency Analysis:** Introduction, Amplification in the AC Domain, BJT Transistor Modeling, The Important Parameters: Z_i, Z_o, A_v, A_i ,The r_e Transistor Model, The Hybrid Equivalent Model, Graphical Determination of the *h*-parameters**,** Common-Emitter Fixed-Bias Configuration, Voltage-Divider Bias, CE-Emitter Bias configuration, Emitter-Follower Configuration, Common-Base Configuration. • **High Frequency Analysis:** Hybrid–pi CE transistor model, Hybrid–pi conductance, Hybrid–pi capacitances, Validity of hybrid–pi model, Variation of hybrid–pi parameters, CE short-circuit current gain, Current gain with resistive load, Single-stage CE transistor amplifier response, Gain-bandwidth product	15
2.	**Building Blocks of Amplifiers:** Comparison of the MOSFET and BJT, IC Design Philosophy, The Basic Gain Cell, Cascade Amplifier, IC Biasing-Current Sources & Current Mirrors Circuits , Cascade Configurations: CC-CE, CD-CS, CD-CE, 10Darlington, CC-CB and CD-CG.	5
3.	**Large Signal Amplifiers (Power Amplifier):** Introduction—Definitions and Amplifier Types, Series-Fed Class An Amplifier, Transformer-Coupled Class-A Amplifier, Class-B Amplifier Operation and Circuits, Amplifier Distortion, Class-C and Class-D Amplifiers.	5
4.	**Operational Amplifiers & Application**: Introduction, Block Diagram representation of a typical op-amp, Input offset voltage, Input bias current, Input offset current, Total output offset voltage, Thermal Drift, Effect of variation in power supply voltages on offset voltage, Change in input offset voltage and input offset current with time, Other temperature and supply voltage sensitive parameters, Noise, Application: amplifiers , comparators, converters.	8

Unit No.	Topics	Teaching Hours
5.	**Feedback And Oscillator Circuits:** Feedback Concepts, Feedback Connection Types (Voltage-Series, Voltage-Shunt, Current-Series, Current-Shunt), and The Important Parameters: Z_i, Z_o, A_v, A_i, Feedback Amplifier—Phase and Frequency Considerations. Oscillator Operation, Basic Principles of Sinusoidal Oscillators, Phase-Shift Oscillator, Wien Bridge Oscillator, Tuned Oscillator Circuit, Crystal Oscillator, Unijunction Oscillator	7
6.	**Signal Generators and Waveform-Shaping Circuits** : Generation of Square & Triangular Waveforms Using Astable Multivibrator, Bistable Multivibrator, Generation of a Standardized Pulse-The Monostable Multivibrator, Integrated-Circuit Timers, Nonlinear Waveform-Shaping Circuits, Precision Rectifier Circuits using 555 Timer IC. PLL and FLL, Phase and Frequency Followers, Frequency Locked Loop.	5
	Total	**45**

List of References:

1. Millman Halkias "*Integrated Electronics"*, (2011) 2nd Edition, McGraw hill.
2. Robert Boylestad and Louis Nashelsky, *"Electron Devices and Circuit Theory*", (2008), 10th edition, Pearson Prentice Hall.
3. Sedra/Smith *"Microelectronic Circuits"*, (2010),6th Edition, Oxford University,
4. Ramakant A. Gaikwad *"Opamp and Linear Integrated Circuits*", (2009), 4th Edition, PHI.
5. J. Michael Jacob *"Analog integrated circuit applications"*, (200), Prentice Hall.
6. David Bell, *"Electronic devices & circuits*", (2008), 5th Edition, Oxford Publications.

Course Outcomes (COs):

By learning this course students will be able to …

1. Understand & Analyze BJT circuits at low and high-frequency.
2. Design Building Blocks of Amplifiers.
3. Categorize various audio frequency power amplifier circuits and their comparison.
4. Study and measure various OPAMP parameters and its applications.
5. Design Feedback oscillator circuits.
6. Analyze Signal Generators and Waveform-Shaping Circuits and applications like PLL, FLL.