FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **BACHELOR OF TECHNOLOGY in Electronics & Communication Engineering**

Semester: **III**

Course Code: **202060303**

Course Title: **Electronics Devices and Circuits**

Course Group: Professional Core Course

Course Objectives: The course is designed to make students understand analysis and design of the BJT DC Biasing & various small signal AC analysis for BJT circuits, to learn and analyze the FET biasing circuits. The course will also cover the basic operation of the various Feedback Amplifiers and Oscillator circuits.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50/18	50/17	25/9	25/9	150/53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Bipolar Junction Transistor – DC Biasing:** Introduction, Operating Point, Fixed Bias Configuration, Emitter-Bias Configuration, Voltage-Divider Bias Configuration, Collector Feedback Configuration, Emitter-Follower Configuration, Common-Base Configuration, Miscellaneous Bias Configurations	4
2	**Bipolar Junction Transistor – AC Analysis:** Introduction, Amplification in the AC Domain, BJT Transistor Modeling, the r_e Transistor Model, Common-Emitter Fixed-Bias Configuration, Voltage-Divider Bias, CE Emitter-Bias Configuration, Emitter Follower Configuration, Common-Base Configuration, Collector Feedback Configuration, Collector DC Feedback Configuration, Effect of R_L and Rs, Determining the Current Gain, Summary Tables, Two-Port Systems Approach, Cascaded Systems, Darlington Connection, Feedback Pair, The Hybrid Equivalent Model, Approximate Hybrid Equivalent Circuit, Complete Hybrid Equivalent Model, Hybrid ∏ Model, Variations of Transistor Parameters, Troubleshooting	8

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

3	**Field Effect Transistors and Biasing Circuits:** Introduction, Construction and Characteristics of JFET's, Transfer Characteristics, Specification Sheets (JFETs), Instrumentation, Important Relationships, Depletion-Type MOSFET, EnhancementType MOSFET, Fixed-Bias Configuration, Self-Bias Configuration, Voltage-Divider Biasing, Common-Gate Configuration, Special Case $V_{GSQ} = 0V$, Depletion-Type MOSFETs, Enhancement-Type MOSFETs, Summary Table	**8**
4	**FET Amplifiers:** Introduction, JFET Small-Signal Model, Fixed-Bias Configuration, Self-Bias Configuration, Voltage- Divider Configuration, Common- Gate Configuration, Source-Follower (Common-Drain) Configuration, Depletion-Type MOSFETs, Enhancement-Type MOSFETs, E-MOSFET Drain-Feedback Configuration, E-MOSFET Voltage-Divider Configuration	**6**
5	**Power Amplifiers:** Class A large Signal Amplifiers, Second Harmonic Distortion, Higher –Order Harmonic Generation, Transformer Coupled Audio Power Amplifier, Efficiency, Push-Pull Amplifiers, Class B Amplifiers, Class AB Operation, Class C Amplifiers	**6**
6	**Feedback Amplifiers:** Classification of Amplifiers, Feedback Concept, Transfer Gain with Feedback, General Characteristics of Negative Feedback Amplifiers, Input Resistance, Output Resistance, Method of Analysis of a Feedback Amplifier, Voltage Series Feedback, A Voltage Series Feedback Pair, Current Series Feedback, Current Shunt Feedback, Voltage Shunt Feedback	**8**
7	**Oscillators:** Sinusoidal oscillators, Phase-shift oscillator, Resonant circuit oscillators, A general form of oscillator circuit, Wien bridge oscillator, Crystal oscillators, Frequency stability	**5**
		45

List of Practicals / Tutorials:

1	To verify performance of various Clipper and Clamper circuits.
2	To obtain characteristic of transistor as a switch circuit.
3	To obtain input and output characteristics and calculate gain of CE amplifier circuit.
4	To obtain input and output characteristics and calculate gain of CB amplifier circuit.
5	To obtain frequency response of single stage transistor amplifier.
6	To study h parameter analysis for Differential Amplifier configurations.
7	To obtain the transfer characteristics of FET.
8	To obtain the transfer characteristics of MOSFET.
9	To test the performance of negative feedback amplifier and compare gain, BW with amplifier without feedback.
10	To study the effect of current series feedback on single stage CE amplifier.
11	To study Hartley and Colpitt's Oscillator.
12	To study Clapp and Blocking Oscillator.

Reference Books:

1	Boylestead and Nashelsky**, Electronics Devices and Circuits Theory**, 11th Edition, PHI.
2	Millman & Halkias**, Electronic Devices and Circuits**, 4th Edition, McGraw Hill.
3	Albert Malvino, **Electronics Principles**, 8th Edition, McGraw Hill.

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

4	S Salivahanan and N Suresh Kumar**, Electronics Devices & Circuits,** , 4th Edition, Tata McGraw Hill.

Supplementary learning Material:	
1	https://www.makerspaces.com/basic-electronics/
2	Ng-spice/Multisim www.nptel.com
3	NPTEL and Coursera Video Lectures

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
10	25	10	25	10	10	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Analyze and design BJT DC Biasing circuits	**10**
CO-2	Apply the concept of small signal analysis for BJT in hybrid pi and re model	**20**
CO-3	Comprehend the operation of FET and various affiliated biasing circuits	**20**
CO-4	Understand various FET amplifier circuits	**20**
CO-5	Analyze and conceptualize Feedback amplifiers and Oscillator circuits.	**30**

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

Curriculum Revision:	
Version:	**2.0**
Drafted on (Month-Year):	June -2022
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in