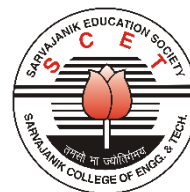




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Sarvajani College of Engineering and Technology
Bachelor of Technology



B. Tech. Semester III

Subject Name: Electronics Circuit

Subject Code: BTEC13301

Type of course: PCC

Prerequisite: Basic Electronics

Rationale: Electronic Circuits is playing a key role in all engineering applications. All engineers should have knowledge of electronic circuits and applications. The purpose of this subject is to make students familiar with electronics concepts related to circuit implementation and its related applications. Students will be able to design various amplifier circuits and other electronic applications.

Teaching and Examination Scheme:

| Teaching Scheme | | | | Theory Marks | | | Practical Marks | | Total |
|-----------------|---|---|---|--------------|-----|-----|-----------------|-----|-------|
| L | T | P | C | TEE | CA1 | CA2 | TEP | CA3 | 150 |
| 3 | 0 | 2 | 4 | 60 | 25 | 15 | 30 | 20 | |

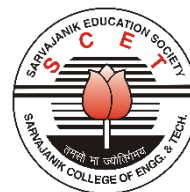
CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

| Sr. No. | Topics | Teaching Hrs. | Module % Weightage |
|---------|---|---------------|--------------------|
| 1. | Bipolar Amplifiers: General Considerations: Input and Output Impedances, Biasing, DC and Small-Signal Analysis, Operating Point Analysis and Design: Simple Biasing, Resistive Divider Biasing, Biasing with Emitter Degeneration, Self-Biased Stage, Biasing of PNP Transistors, Bipolar Amplifier Topologies: CE Topology, CB Topology, Emitter Follower. | 9 | 20 |
| 2. | MOS Transistors: Structure of MOSFET, Operation of MOSFET, MOS Amplifier Topologies, Biasing, Realization of Current Sources, CS Stage, CG Stage, Source Follower. | 7 | 16 |
| 3. | Cascode Stages and Current Mirrors: Cascode as a Current Source, Cascode as an Amplifier, Initial Thoughts, Bipolar Current Mirror, MOS Current Mirror. | 7 | 16 |
| 4. | Frequency Response: General Considerations, High-Frequency Models of Transistors, | 8 | 18 |



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Bachelor of Technology



| | | | |
|----|---|---|----|
| | Frequency Response of CE and CS Stages, Frequency Response of CB and CG Stages, Frequency Response of Followers, Frequency Response of Cascode Stage. | | |
| 5. | Feedback: Loop Gain, Properties of Negative Feedback, Types of Amplifiers, Feedback Topologies, Effect of Finite I/O Impedances, 8 Stability in Feedback Systems | 8 | 17 |
| 6. | Output Stages and Power Amplifiers: Emitter Follower as Power Amplifier, Push-Pull Stage, Improved Push-Pull Stage, Large-Signal Considerations, Short-Circuit Protection, Heat Dissipation, Efficiency, Power Amplifier Classes. | 6 | 13 |

Suggested Specification table with Marks (Theory/Practical):

| % Distribution of Marks | | | | | |
|-------------------------|---------|---------|---------|---------|---------|
| R Level | U Level | A Level | N Level | E Level | C Level |
| 20 | 20 | 20 | 20 | 10 | 10 |

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels (**Revised Bloom's Taxonomy**)

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.

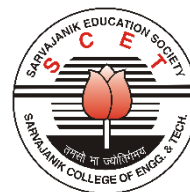
Reference Text Books:

| Sr. No. | Title of book /article | Author(s) | Publisher and details like ISBN | Year of publication | Publication Edition |
|---------|-------------------------------------|------------------------------|---------------------------------|---------------------|---------------------|
| 1. | Fundamentals of Microelectronics | Behzad Razavi | Wiley India | 2013 | 2 nd |
| 2. | Microelectronic Circuits | Adel S. Sedra K. C. Smith | Oxford University Press India | 2010 | 6 th |
| 3. | Electronic devices & circuit theory | Boylestad & Nashlesky | PHI | 2015 | 11 th |
| 4. | Principle of electronics | V. K. Mehta Rohit Mehta | S. Chand | 2014 | 12 th |
| 5. | Electronic Devices | Thomas L. Floyd | Pearson | 2012 | 9 th |

Course Outcome:



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| Sr. No. | CO Statement After learning this subject students will be able to, | Marks % weightage |
|---------|---|----------------------|
| CO-1 | Describe various biasing circuits for transistor as an amplifier. | 15 |
| CO-2 | Analyze low frequency analysis of BJT and FET amplifiers. | 15 |
| CO-3 | Analyse MOSFET for various voltage control applications. | 15 |
| CO-4 | Analyze multistage amplifier and its performance characteristics. | 15 |
| CO-5 | Analyze high frequency analysis of BJT and FET amplifiers. | 10 |
| CO-6 | Explain various negative feedback topologies and apply them to design dual stage transistor circuits. | 20 |
| CO-7 | Describe various power amplifiers. | 10 |

Mapping with POs:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO-1 | 2 | 2 | 2 | 3 | 3 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 2 |
| CO-2 | 2 | 2 | 2 | 3 | 3 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 2 |
| CO-3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 2 |
| CO-4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 |
| CO-5 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 |
| CO-6 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 |
| CO-7 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 |

List of practical:

- To study and implement various transistor biasing circuits.
- To study the Two Stage RC coupled Amplifier & To find out
 - Frequency response of individual stages & frequency response of overall amplifiers.
 - Gain of individual stages & gain of overall amplifier.
 - Find out Bandwidth of individual stages & of overall amplifier.
- To study and implement various FET biasing circuits.
- To implement FET as an amplifier and plot input characteristics and transfer characteristics.
- To implement FET as a switch/ voltage variable resistor.
- To plot frequency response & to find out input & output impedance of
 - without feedback (b) with feedback of given Current Series Negative Feedback Amplifier.
- To plot frequency response & to find out input & output impedance of
 - without feedback (b) with feedback of given Voltage Series Negative Feedback Amplifier.
- To study the frequency response and bandwidth BJT/ FET amplifiers.



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Bachelor of Technology



9. To study the operation of Class A Power Amplifier and find the efficiency.
10. To study the operation of Class B Power Amplifier and find the efficiency.
11. To study the operation of Class C Power Amplifier and find the efficiency.

Major Equipment:

- CRO, Function Generator, Power Supply, Digital multi-meter, Transformer, Trainer Boards, Diode, Transistor, FET, MOSFET

List of Open Source/learning website:

- <http://www.infocobuild.com/education/audio-video-courses/electronics/BasicElectronics-Patil-IIT-Bombay>
IITB: Video Lectures 22 to 31-BJT Basic Operations, BJT Biasing, BJT Amplifier, CE Amplifier, Small Signal Modelling
- <https://www.ee.iitb.ac.in/course/~dghosh/mosfetSlides.pdf>
IITB: MOSFET Characteristics, BJT-MOSFET comparison
- https://www.ee.iitb.ac.in/~sequel/ee207/sd_mos_1.pdf
IITB: MOSFET and High-end calculations

List of Open Source software:

- LTSpice, TinkerCad, Multisim