SARVAJANIK UNIVERSITY
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Sarvajanik University
Sarvajanik College of Engineering & Technology, Surat
Bachelor of Technology (B. Tech.)

B. Tech. Semester I/II

Subject Name: Basic Electronics **Subject Code: BTEC12112**

Type of course: Engineering Science
Prerequisite: Basic Knowledge of Semiconductor material
Rationale: Electronics is playing a key role in all engineering applications. All engineers should have basic knowledge of electronics. Purpose of this subject is to make students familiar with basic electronics concepts. Students will be able to design basic 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	
3	0	2	4	60	25	15	30	20	150

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.	**Review of Diode and Special purpose diodes:** P-N Junction diode construction and working, Diode circuits like Rectifier, Clipping and Clamping circuit. Special diodes like Zener Diode, Light Emitting Diode (LED) and application in seven segment display, Photo Diode, Solar Cell and their applications	5	15%
2.	**Bipolar Junction Transistors, FETS and MOSFETS** Construction, types, V-I Characteristics, region of operation, BJT as a switch and CE amplifier. Comparison of CE, CB and CC circuits. Working principle, characteristics and comparison of BJT and FET MOSFETs.	5	20%
3.	**Analog Electronics** Introduction and Block diagram to Op-Amp IC 741. Applications of	6	15%

Sr. No.	Topics	Teaching Hrs.	Module Weightage
	Op-Amp as inverting-non inverting amplifiers, differential amplifiers, instrumentation amplifier, Analog electronics in modern devices like mobile phones, LNA used with DISH antenna, Satellite receivers.		
4.	**Digital Electronics** Binary and hexadecimal numbers used for digital electronics, logic gates, microcontrollers and interfacing peripheral components like LCD display, switches and sensors.	8	15%
5.	**Introduction to Modern Communication System** Introduction, system components, RF spectrum, Modulation in communication, AM, FM and PCM modulation techniques. different types of communication networks-cellular network, fibre optic network, microwave-satellite network. Comparative analysis of 3G-4G-5G communication system. Context and spread of communication technology in INDIA and overseas.	6	15%
6.	**Transducers** General concepts and terminology of measurement systems, transducer classification, general input-output configuration, static and dynamic characteristics of a measurement system. Variable resistance transducers: Potentiometers, metal and semiconductor strain gauges' strain gauge applications: Load and torque measurement. Inductive transducers: Transformer type, eddy current transducers, proximity detectors, Capacitive transducers Piezoelectric transducers photoelectric transducers, Hall effect sensors, Magneto-strictive transducers, Digital displacement sensors, Fiber optic sensor, Semiconductor sensor and Smart sensors.	15	20%

Suggested Specification Table of Marks as per Bloom's Taxonomy (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20 %	**20 %**	**30 %**	**10 %**	**10 %**	**10 %**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels.

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	Principle of Electronics	V.K.Mehta, Rohit Mehta	S.Chand		
2	Electronic Devices and Circuit	J B Gupta	Katson	2016	6th
3	Electronic Communication	Dennis Roddy, John Coolen	Pearson	2014	4th
4	Wireless and Cellular Communications	Dr. Sanjay Sharma	Katson		
5	Electronic Devices and Circuit theory	Robert Boylstad Louis Nasheslsky	Pearson		

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Implement various Diode circuits and their applications. *(R,U,A,N - Cognitive level)*	15
CO-2	Implement and analyze transistor amplifier circuit configurations and their use in the electronics world. *(R,U,A,N - Cognitive level)*	20
CO-3	Build and test analog circuits using OP AMP and their uses like signal conditioning, signal Mixing and amplifications. *(R,U,A,N - Cognitive level)*	15
CO-4	Implement and test various digital circuits using digital gates, and exhibit knowledge about driving various devices/appliances. *(R,U,A,N - Cognitive level)*	15
CO-5	Explain Communication systems and its constituents. *(R,U,A,N - Cognitive level)*	15
CO-6	Build and test circuits using various sensors and their uses in/as industrial applications. *(R,U,A,N - Cognitive level)*	20

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	PO 12	PSO 1	PSO 2	PSO 3
CO-1	2	2	2	3	3	1	2	2	3	2	3	2			

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-2	2	2	2	3	3	1	2	2	3	2	3	2			
CO-3	3	3	3	3	3	3	3	2	3	2	3	2			
CO-4	3	3	3	3	3	3	3	2	3	2	3	2			
CO-5	2	3	3	3	3	3	3	2	3	3	3	2			
CO-6	2	3	3	3	3	3	3	2	3	3	3	2			
Rationale*	14	16	16	18	18	14	16	12	18	14	18	12			

***Rationale:** Explaining why it is matching this particular program outcome

List of practical:

1. a) Study of different basic Electrical/Electronic components like resistor, capacitor, inductor, potentiometer, Diode, LED, Zener Diode, Transistor, IC etc.
   b) Study and measurement of different devices like CRO, Function Generator, Power Supply, Digital multi-meter etc.
2. To study and implement the forward and reverse characteristics of a P-N junction diode. Find the forward resistance.
3. To study Half Wave Rectifier and to calculate ripple factor and efficiency with filter and without filter.
4. To study the Full Wave Bridge Rectifier and to calculate ripple factor and efficiency with filter and without filter.
5. To study and draw reverse characteristics of a Zener diode and to study Zener diode as a voltage regulator for (a) Supply Voltage regulation and (b) Load voltage regulation.
6. To study and implement Clipper circuits using Diode.
7. To study and implement Clamper circuits using Diode.
8. To study and plot input and output characteristics for a Common Emitter (CE) Transistor Configuration.
9. To study and implement CE transistor configuration as an amplifier.
10. To study and implement Inverting and Non Inverting amplifiers using Op-Amp with a gain of 10 and 11 respectively.
11. Verification and interpretation of truth tables for AND, OR, NOT, NAND, NOR Exclusive OR (EX-OR), Exclusive NOR (EX-NOR) Gates.

12. Interfacing Microcontroller with LCD.
13. To study Amplitude and Frequency Modulation. (AM/FM)
14. Design and implement RTD transducer with signal conditioning.
15. Design and implement LVDT.

Major Equipment:

- CRO, Function Generator, Power Supply, Digital multi-meter, Transformer, Trainer Boards

List of Open Source/learning website:

- https://nptel.ac.in/courses/108/101/108101091/
  Diode circuits, BJT amplifiers, Op Amp circuits, Digital Circuits
- https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-ee55/
  Diode circuits, BJT amplifiers, Op Amp circuits will be covered. In the digital part, combinatorial and sequential circuits will be covered
- http://www.infocobuild.com/education/audio-video-courses/electronics/BasicElectronics-Patil-IIT-Bombay/
  Transistor, Digital Basics
- https://nptel.ac.in/courses/117/105/117105143/
  Modulation, AM, FM
- https://nptel.ac.in/courses/108/105/108105102/
  Microcontroller and Interfacing
- http://he-coep.vlabs.ac.in/List%20of%20experiments.html?domain=ElectronicsandCommunications
  Virtual Lab for Hybrid Electronics
- http://cse15-iiith.vlabs.ac.in/List%20of%20experiments.html?domain=Computer%20Science
  Virtual Lab for Digital Electronics
- http://sl-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering
  Virtual Lab for Sensors

List of Open Source Software:

- LTSpice, TinkerCad, Multisim