

## GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

### COURSE CURRICULUM

Course Title: Electronic Circuits and Applications  
(Code: 3321101)

<b>Diploma Programme in which this course is offered</b>	<b>Semester in which offered</b>
Electronic and Communication Engineering	Second Semester

#### 1. RATIONALE

This course will enable students to develop the skills required to use basic electronic devices in various electronic circuits. Through the study of this course the students will understand the construction, working, characteristics and applications of various types of semiconductor components such as diodes and transistors, which are basic building block of amplifier, oscillator, switching circuit, wave shaping circuit and power supply. The knowledge of this core subject is essential for comprehending the courses that will be introduced later in the diploma programme as well as developing requisite skills for effective functioning in the industry.

#### 2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- **Analyse analog circuits consisting of active electronic components.**

#### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	200
4	0	4	8	70	30	40	60	

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

**Note:** It is the responsibility of the institute heads that marks for **PA of theory & ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

#### 4. DETAILED COURSE CONTENT

Unit	Major Learning Outcomes	Topics and Sub-topics
<b>Unit – I</b> <b>Diode Application and Special Purpose Diodes</b>	1a. Explain working of clipper and clamper.	1.1 Basic diode circuits, clipper and clamper, voltage doubler
	1b. Describe working, characteristic and applications of different diodes.	1.2 Zener diode as a voltage regulator 1.3 Varactor diode, schottky barrier diode, crystal diode
	1c. Explain the working and applications of photo devices.	1.4 Photo Diode, LDR, Photovoltaic Cell, Photo Transistor, Light Emitting Diode, Opto coupler, 7-Segment Display, OLED, AMOLED, Multi color LED
<b>Unit – II</b> <b>Transistor Amplifier and Applications</b>	2a. Compare working of CB, CE and CC amplifier.	2.1 Transistor Amplifier: CB, CE, CC 2.2 Comparison of CB,CE and CC Amplifier
	2b. Calculate parameters of CB, CE, CC transistor amplifier.	2.3 Load line consideration and operating point 2.4 Amplifier Parameters: $A_v$ , $A_i$ , $A_p$ , $R_o$ , $R_i$
	2c. Explain the need for Darlington Pair.	2.5 Darlington Pair and its applications
	2d. Describe application of transistor as a Relay Driver and Tuned Amplifier.	2.6 Transistor used as a Relay Driver 2.7 Transistor used as a Tuned Amplifier
<b>Unit – III</b> <b>Transistor Biasing Circuits and Thermal Stability</b>	3a. Test different biasing circuits.	3.1 Biasing; Biasing Circuits: Fixed Bias, Collector to Base bias, Emitter Bias and Voltage divider bias
	3b. Define thermal instability and its adverse effect on working of any circuit.	3.2 Thermal instability
	3c. Justify the need of heat sink. 3d. Select appropriate heat sink.	3.3 Thermal Runaway and Stability Factor 3.4 Thermal Resistance 3.5 Heat Sink 3.6 Types of Heat sink: Shape, Size, Color, Material
<b>Unit – IV</b> <b>Frequency Response of Transistor Amplifier</b>	4a. Define amplifier parameters: gain, Bandwidth and Gain – bandwidth product .	4.1 Gain, Bandwidth and Gain-Bandwidth product 4.2 Effect of Emitter Bypass Capacitor and Coupling Capacitor on frequency response
	4b. Determine frequency response of CE amplifier using different types of coupling.	4.3 Frequency Response of Single Stage Amplifier 4.4 Different Coupling Techniques for cascading: Direct, RC, LC and Transformer
	4c. Describe the various types of couplings of amplifier.	4.5 Frequency Response of Two Stage RC-Coupled amplifier
<b>Unit – V</b>	5a. Describe importance of	5.1 Two port network ,h-parameters and its equivalent

Unit	Major Learning Outcomes	Topics and Sub-topics
<b>Hybrid Parameters</b>	h- parameters of the two port network. 5b. Analyse CE amplifier using h-parameters.	circuits 5.2 h-parameters for CE amplifier 5.3 CE Amplifier parameters- $A_v$ , $A_i$ , $A_p$ , $R_o$ , $R_i$ using h- parameters (No Derivations)
<b>Unit – VI</b> <b>Regulated Power Supply</b>	6a. Explain parameters of the regulator and the need of regulated DC power supply. 6b. Explain the working of different voltage regulator circuits.	6.1 Regulated power supply (module level) 6.2 Shunt voltage regulator (module level) 6.3 Transistorized series voltage regulator (basic and with feedback, without derivation) 6.4 Three Terminal Fixed/variable voltage regulator: 78xx, 79xx, LM317
	6c. Explain need, working at module level, advantage, disadvantages and applications of SMPS. 6d. Compare LRPS and SMPS. 6e. Explain working of UPS at module level for offline and online.	6.5 Switch mode power supply(SMPS) 6.6 Uninterruptible power supply(UPS)

### 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Diode application and special purpose diodes	10	2	6	6	14
II	Transistor biasing circuits and thermal Stability	10	2	6	4	12
III	Transistor amplifier	10	4	6	4	14
IV	Frequency response of transistor amplifier	10	4	6	2	12
V	Hybrid parameters	6	2	2	2	6
VI	Regulated power supply	10	2	4	6	12
<b>Total</b>		<b>56</b>	<b>16</b>	<b>30</b>	<b>24</b>	<b>70</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

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

## 6. SUGGESTED LIST OF EXERCISES/PRACTICALS

The experiments should be properly designed and implemented with an attempt to develop different types of skills leading to achieve the competency. Following is the list of experiments for guidance.

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1	I	Use multimeter for measuring electrical parameter, value of passive component like resistor and capacitor and testing of diode, transistor.	02
2	I	Determine voltage and frequency of sine, square and triangular wave signal using CRO.	02
3	I	Build various types of clipper circuit and observe input –output waveforms. Design a diode clipper circuit for the given value of clipping voltage.	02
4	I	Build various types of clamper circuit and observe input – output waveforms. Design a diode clamping circuit for the given value of clamping voltage.	02
5	I	Obtain the V-I Characteristic of zener diode.	02
6	I	Design voltage regulator for the given value of regulated voltage using zener diode.	02
7	I	Obtain V-I characteristic of photo diode.	02
8	I	Obtain the V-I Characteristic of LDR.	02
9	I	Build and display alphanumeric character using single/multi coloured LED.	02
10	I	Display numbers using 7 segment LED (Common Anode and Common Cathode- Both)	02
11	II	Test thermal stability of fixed biased type amplifier.	02
12	II	Build and test voltage divider biased type amplifier and measure voltage at different points on the circuit and observe waveforms.	02
13	III	Obtain input and output characteristics and calculate gain of CE amplifier circuit.	02
14	III	Obtain input and output characteristics and calculate gain of CB amplifier circuit.	02
15	III	Build amplifier using Darlington pair and calculate its gain.	02
16	IV	Obtain frequency response of single stage transistor amplifier.	02
17	IV	Obtain frequency response of two stage RC-coupled amplifier.	02
18	V	Calculate h-parameters of given transistor using data sheet.	02
19	VI	Calculate line regulation of SMPS.	02
20	VI	Build voltage regulator using 78xx and 79xx and measure the dropout voltage for the given voltage regulator.	02
21	VI	Build variable voltage regulator using LM317 and measure the dropout voltage for the given voltage regulator.	02
22	VI	Demonstration of working of UPS (Online/Offline).	02
23	All	Build and test one mini project using basic electronic components and general purpose PCB.	02
<b>Total</b>			<b>46</b>

## 7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- Build circuit/mini project using electronic components.
- PPT Presentation/Seminar on syllabus topic/mini project.
- Simulate experiments using available Electronic Design Automation Tools like Circuit maker, Tina, Multisim, Electronic work bench etc.

## 8. SUGGESTED LEARNING RESOURCES

### (A) List of Books:

S. No.	Title of Books	Author	Publication
1	Electronic Principles with simulation CD	Malvino A.P	MGH, 2009 or latest
2	Electronic Devices and Circuit Theory	Boylestad Robert	Pearson, 2007 or latest
3	Principles of Electronics	Mehta V.K	S. Chand, or latest
4	Electronic Devices and Circuits	Bell David A	Oxford University Press, 2008 or latest
5	Basic Electronics – A text lab manual	Zbar Paul B, Malvino Albert Michael Miller	MGH, latest edition
6	Basic Electronics and Linear Circuits	Kulshreshtha, Bhargava and Gupta	TMH, 2006 or latest

### Other Learning Resources

- Electronic Component Data sheets - BPB Publications, New Delhi
- Electronics engineering magazines like EFY, Elector etc.

### B. List of Major Equipment/Materials

- i. Function Generator
- ii. Multimeter
- iii. D.C. Power Supply
- iv. Variac
- v. Cathode Ray Oscilloscope
- vi. Digital Storage Oscilloscope
- vii. Experimental Trainer Kits, Bread Board, General Purpose PCB

### C List of Software/Learning Websites

- i. Electronic Work Bench/MultiSIM
- ii. [www.nptel.com](http://www.nptel.com)
- iii. [www.ocw.mit.edu](http://www.ocw.mit.edu)

## 9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### Faculty Members from Polytechnics

- **Prof. S.N.Sampat**, Senior Lecturer, Department of Electronics and Communication, Government Polytechnic, Gandhinagar
- **Prof.(Smt.) Kundan N. Vaghela**, Senior Lecturer, Department of Electronics and Communication, Government Polytechnic, Ahmedabad
- **Prof. N.B.Shah**, Senior Lecturer, Department of Electronics and Communication, Government Polytechnic, Vadnagar
- **Prof. B.P.Raval**, Senior Lecturer, Department of Electronics and Communication, Government Polytechnic, Rajkot

### Coordinator and Faculty Members from NITTTR Bhopal

- **Prof.(Mrs.)Susan S. Mathew**, Associate Professor, Dept. of Electrical and Electronics Engg.
- **Dr.(Mrs.)Anjali Potnis**, Assistant Professor, Dept. of Electrical and Electronics Engg.