

## GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

### COURSE CURRICULUM

**Course Title: ELECTRONICS COMPONENTS AND CIRCUITS  
(Code: 3330905)**

<b>Diploma Programme in which this course is offered</b>	<b>Semester in which offered</b>
Electrical Engineering	Third Semester

#### 1. RATIONALE

This course will develop the skills to use electronic devices in various electronic circuits in the industry. Through the study of this course the students will be able to 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 course is essential for comprehending the advance courses in the later semesters.

#### 2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Use discrete electronic devices and components in various circuits**

#### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
04	00	02	06	70	30	20	30	<b>150</b>

**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. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
<b>Unit – I Semiconductor Diode and its Applications</b>	1a. State types of semiconductor materials  1b. Describe working, characteristic and applications of PN junction diodes.  1c. Explain need & types of filters	1.1 Semiconductor materials, Intrinsic semiconductor, Extrinsic semiconductor :P type, N type semiconductor with energy level diagram 1.2 P-N junction diode: Symbol, Construction, working, forward bias and reverse bias characteristics, applications 1.3 Diode as rectifier 1.4 Working of single phase half wave, full wave and bridge wave rectifier 1.5 Types of Filters : C,L,LC, $\Pi$ 1.6 Type of P-N junction formation - grown junction , alloy junction, epitaxial junction
<b>Unit – II Transistors, voltage &amp; power amplifiers</b>	2a Describe formation of transistor. 2b Compare working of CB, CE and CC transistors.  2c Explain the need of voltage amplifier 2d Explain the need of power amplifier 2e Select the voltage amplifier for a particular application 2f Select the power amplifier for a particular application	2.1 Formation of a transistor i. PNP & NPN transistor ii. Conduction through transistor iii. Leakage current in transistor iv. Relationship between $\alpha$ & $\beta$ 2.2 Transistor configuration & characteristics for CB,CE,CC 2.3 Load line and biasing methods of transistor  2.4 Transistor as an amplifier : CE amplifier 2.5 Cascade amplifiers 2.6 Concept of power amplifier 2.7 Class A Amplifier : Series fed & Transformer-Coupled amplifier 2.8 Class B push pull Amplifier Operation 2.9 Amplifier Distortion
<b>Unit – III Oscillators</b>	3a. State working of oscillator 3b. Select oscillator for different frequency generation	3.1 Working principle of oscillators 3.2 Hartley oscillator 3.3 Colpitts oscillator 3.4 Phase-Shift Oscillator 3.5 Wien Bridge Oscillator 3.6 Crystal Oscillator
<b>Unit – IV Special Semiconductor Devices</b>	4a. Describe working, characteristic and applications of different diodes 4b. Describe working, characteristic and applications of different semiconductor devices 4c. Explain the working and applications of few photo devices	4.1 Symbol, Construction, working, characteristics, applications of Zener diode. 4.2 Symbol, Construction, working, characteristics, applications of Photo diode LDR, Photovoltaic Cell, Light Emitting Diode 4.3 Construction, characteristics & applications of 4.3.1 FET & MOSFET 4.3.2 DIAC 4.3.3 UJT 4.3.4 TRIAC 4.3.5 SCR

Unit	Major Learning Outcomes	Topics and Sub-topics
<b>Unit – V Simple circuit using IC</b>	5a. Describe need of I.C. and characteristic of OPAMP. 5b. Explain need of IC 555 Timer 5c. Select OPAMP IC 741 for a particular application 5d. Select IC 555 timer for a particular application	5.1 Need of I.C. 5.2 Concept of operational amplifier 5.3 Characteristic of Ideal OPAMP. 5.4 Characteristic & Specification of OPAMP- IC 741 5.5 Block diagram and applications of IC 555 timer
<b>Unit – VI Regulated power supplies</b>	6a. Explain parameters of the regulator and the need of regulated DC power supply. 6b. Explain the working of different voltage regulator circuits 6c. Explain working of SMPS & UPS	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 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	Semiconductor diode & its applications	10	4	5	6	15
II	Transistors , voltage & power amplifiers	14	7	7	4	18
III	Oscillators	08	3	4	3	10
IV	Special Semiconductor devices	10	5	3	4	12
V	Simple circuit using IC	06	2	2	3	07
VI	Regulated power supplies	08	2	2	4	08
<b>Total</b>		<b>56</b>	<b>23</b>	<b>23</b>	<b>24</b>	<b>70</b>

**Legends:** R = Remember; U = Understand; A = Apply and above levels (Bloom's revised 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/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire the competency.

Following is the list of experiments for guidance.

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1	I	Test PN junction diode.	02
2	I	Test Half wave rectifier using CRO	02
3	I	Test full wave centre tapped & bridge rectifier using CRO	02
4	I	Compare output waveform of different Filters using CRO	02
5	II	Test the performance of CB transistor amplifier	02
6	II	Test the performance of CE transistor amplifier	02
7	II	Testing of transistor using multimeter	02
8	II	Test the performance class – B push pull amplifier	02
9	III	Test Hartley oscillator using CRO	02
10	III	Test Colpitts oscillator using CRO	02
11	IV	Test LED and LDR	02
12	IV	Test J-FET amplifier	02
13	IV	Test MOSFET amplifier	02
14	IV	Test SCR and UJT	02
15	V	Identify the pins of IC 741 and IC-555	02
16	V	Test the performance of IC 555 timer	02
17	VI	Test zener diode as voltage regulator	02
18	VI	Build voltage regulator using 78xx and 79xx and measure the dropout voltage for the given voltage regulator.	02
19	VI	Test the performance of SMPS	02
20	VI	Test the performance of UPS	02
		<b>Total</b>	<b>40</b>

## 7. SUGGESTED LIST OF STUDENT ACTIVITIES

The student can perform the following activities such as:

- i. Prepare mini project
- ii. Testing of electronic components like diode, transistor, SCR, IC etc.
- iii. Prepare chart for characteristic of various electronics components.
- iv. Survey to collect data sheets for various electronics components used in different circuits.

## 8. SUGGESTED LEARNING RESOURCES

### (A) List of Books:

S. No.	Title of Books	Author	Publication
1	Principle of Electronics	Mehta, V.K.	S.Chand, New Delhi 2012
2	Electronics Principles	Malvino, Albert	TMH, New Delhi 2012
3	Basic Electronics and linear circuits	Bhargava, N.N.	TMH, New Delhi 2012

S. No.	Title of Books	Author	Publication
4	Electronic devices and circuit	Robert Boylestad	PHI, New Delhi 2012
5	Electronics Fundamental and application	Chattopadhyay ,D.	New Age International Publishers 2011
6	Opamp and Linear integrated circuits	Gayakwad, Ramakant	PHI, New Delhi 2010
7	Basic Electronics and linear circuits	Kulshreshtha,D.C. Gupta, S.C.	TTTI, Chandigarh 2007

### B. List of Major Equipment/Materials with Broad Specification

- i. Regulated power supply: *Dual DC , 0-30V/1A & 5V /1A with resolution of 10mV , 2mA*
- ii. Digital Storage Oscilloscope : *300 MHZ Bandwidth , 2GSa/s maximum real time sampling rate refresh rate upto 2000 wfams/s , RS232 & USB connectivity*
- iii. C.R.O. : *30 MHz Bandwidth, 2 channel, 20 ns sampling time.*
- iv. Function generator: *10 HZ to 10MHZ , 10 Vpp , rise & fall time =20ns, manual / external triggering*
- v. Different trainer kits of Electronics.
- vi. Digital Multimeter : *5<sup>1/2</sup> digits resolutions with all basics measurement facility like DC Voltage: 200 mV ~ 1000 V, DC Current: 200  $\mu$ A ~ 10 A, AC Voltage: True-RMS, 200 mV ~ 750 V, AC Current: True-RMS, 20 mA ~ 10 A, 2-Wire, 4-Wire Resistance: 200  $\Omega$  ~ 100 M $\Omega$ , Capacitance Measurement: 2 nF ~ 10000 $\mu$ F, Frequency Measurement: 20 Hz ~ 1 MHz etc., 0.015% DC Voltage Accuracy.*

### C. List of Software/Learning Websites

- i. Electronics work bench
- ii. Circuit maker
- iii. pSpice
- iv. [www.howstuffwork](http://www.howstuffwork)
- v. [www.allaboutcircuits.com/vol\\_1/chpt\\_1/1.html](http://www.allaboutcircuits.com/vol_1/chpt_1/1.html)
- vi. [http://openbookproject.net/electricCircuits/DC/DC\\_5.html](http://openbookproject.net/electricCircuits/DC/DC_5.html)
- vii. [www.kpsec.freeuk.com](http://www.kpsec.freeuk.com)
- viii. [www.electical-electronics.org](http://www.electical-electronics.org)

**9. INSTRUCTION STRATEGY :**

- i. Use Power point presentation
- ii. Use Over-head projector
- iii. Use case study
- iv. Make field visit

**10. COURSE CURRICULUM DEVELOPMENT COMMITTEE****Faculty Members from Polytechnics**

- Prof. A.A. Parmar, Sr. Lecturer, Electrical Engineering Department, B&B Institute of Technology, Vallabhvidyanagar
- Prof. N.R. Suchak, Sr. Lecturer, Electrical Engineering Department, Government Polytechnic, Rajkot
- Prof. J.K. Rathod, HOD, Electrical Engg. Dept., Tolani F.G. Polytechnic, Adipur

**Coordinator and Faculty Members from NITTTR Bhopal**