GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Electronics and Communication Engineering

Course / Subject Code : DI03011021

Course / Subject Name: Applied Electronics

w. e. f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	-
Rationale:	-

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Design and test different types of circuits using operational amplifier IC 741.	R,U,A
02	Choose relevant thyrister for the given application.	R,U,A
03	Design triggering and protection circuits for thyristors	R,U,A
04	Design power converter circuits.	R,U,A
05	Use thyristors in different application	R,U,A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA(M)	PA(I)	ESE (V)	
2	0	2	3	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**OperationalAmplifiers (Op Amps):** Basic block diagram and working of an operational amplifier. Describe IC 741 as anOp-Amp. Pin configuration of IC 741.Op-Amp: open loop and closed loop. Parameters of operational amplifier like, Input and output offset voltage, Input offset current, Input bias current, CMRR,	7	20

	slew rate. The ideal Op.Amp. Equivalent circuit of Op.Amp. Applications of operational amplifiers like Inverting and non-inverting amplifier, Summing amplifier, Comparator, Differentiator, Integrator, Schmitt trigger.		
2.	**Introduction to Thyristors:** Construction, Symbol, working, characteristic and applications of electronics devices like SCR, DIAC, TRIAC, GTO, IGBT, and MCT. Working of SCR using two transistor analogy. Construction and working of Opto-Isolators, Opto-TRIAC, Opto- SCR(LASCR), and Opto-transistor. List advantages, applications of Opto- Isolators. Solid state relay using Opto-Isolators.	6	20
3.	**Turn on and Turn off methods of Thyristor:** Triggering (Turn on) methods of SCR. Commutation(Turn off) techniques of SCR. Thyristor protection: Over current protection, Over voltage protection, Snubber circuit, Gate protection.	3	10
4.	**Power Converters:** Compare Single phase rectifiers and poly phase rectifiers. Describe the applications of Poly- phase rectifiers. Single phase control rectifier using SCR. Poly phase rectifiers. Three-phase H.W. & three-phase F.W. rectifiers. Inverters: Series, Parallel and bridge Inverters. Principle & working of Chopper circuits. Describe the applications of Chopper. Single phase cyclo converters. Describe the working of UPS & SMPS with the help of block diagram. List the applications of UPS & SMPS.	7	25
5.	**Industrial Electronics Applications:** Static switch using SCR. Static circuit breaker using SCR. Single phase AC power control using diac-triac. DC power control circuit using SCR with UJT in triggering circuit. Photo electric relay/switch using LDR, LASCR, photo diode. Solar Photovoltaic (PV) based power generation. RF Heating: Induction heating, Dielectric heating. Stepper motor – construction, working and its applications. Programmable Logic Control – block diagram, working, advantages, applications.	7	25
	Total	**30**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
25	**30**	**45**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Op-Amp and linear integrated circuits Ramakant A. Gayakwad, PHI.
2. Thyristor Engineering M.S. Berde, Khanna publishers.
3. Power electronics devices circuits and application M.H. Rashid, Pearson Education
4. Power electronics M.D.Singh, K.B.Khanchandani, Mc Graw Hill.
5. Applied electronics, R.S.Sedha, S.Chand

(b) Open source software and website:

1. https://nptel.ac.in
2. https://www.tutorialpoint.com
3. Virtual lab

Suggested Course Practical List: If any

1. Build / test inverting amplifier using Op-Amp and observe input,output waveforms on CRO.
2. Build non-inverting amplifier using Op-Amp and observe input, output waveforms on CRO.
3. Build / test Integrator circuit using IC 741 and observe output, input waveforms on CRO for different values of R and C.
4. Build / test diferentiator circuit using IC 741 and observe output, input waveforms on CRO for different values of R and C.
5. Build / test Op-Amp as a summing amplifier.
6. Plot Characteristics of SCR
7. Plot Characteristics of diac
8. Plot V/I Characteristics of triac
9. Perform RC phase shift control of UJT triggered SCR.
10. Perform the operation of commutation on SCR.
11. Test the operation of Inverter(Series,parallel,Bridge).
12. Perform the AC power control using DIAC and TRIAC(Fan regulator).
13. Test Light operated Relay/Photo-electric switch.
14. Build and test mini project.

List of Laboratory/Learning Resources Required:

Suggested Project List:

a) Different application od Op.Amp IC 741like Inverting amplifier,noninverting amplifier,comparater etc.
b) Fan regulator using TRIAC/DIAC
c) Light operated Relay-/Street Light Control.
d) Water Level Controller.
e) Home Appliances Automation.
f) Automatic Door control and counting of persons.
g) Solid State Relay using Diac-Triac
h) SCR Firing using UJT.
i) Arm ROBOT using Stepper Motor.
j) SMPS based on IC7840
k) Battery charger using SCR

Suggested Activities for Students: If any

Find Specifications and package of SCR, DIAC, TRIAC, IGBT, MCT, Opto-TRIAC, Opto-SCR, Opto-Transistor from datasheet.

Collect specification of commercially used UPS, Inverter, and SMPS, Stepper motor.

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