GOVT. POLYTECHNIC BALANGIR
Department of Electrical Engineering

LESSON PLAN: 2025-26

Name of the Faculty: Saiswarup Patel (Guest Faculty)

Subject: Fundamentals of Power Electronics **(Th. 1)**
Program: Diploma in Electrical Engineering Semester: 4th
Total Contact Hours: 45 Total Marks: 100
Assessment: Progressive –30, End Term – 70
Credits: 3

COURSE OBJECTIVES:
At the end of the course the students will be able to
1. Explain the operating principle of power electronic devices
2. Select power electronic devices for specific applications
3. Describe the turn-on and turn-off methods of thyristors
4. Explain the operation and applications of phase-controlled rectifiers.
5. Discuss the operating principle of industrial control circuits.

Unit 1: Power Electronic Devices (Total Classes: 10)

Class No.	Topic	Subtopic	Teaching Aids/Activities	Course Objective
1	Power electronic devices	Working of Power electronic devices	Chalkboard definition writing	CO1
2	Power transistor	Construction of Power transistor	Chalkboard definition writing	CO1
3	Power transistor	Working principle of Power transistor	PPT slides & short video clip	CO1
4	Power transistor	V-I characteristics and uses of Power transistor	Chalkboard definition writing by using graphical representation	CO1
5	IGBT	Construction of IGBT	PPT slides & short video clip	CO1
6	IGBT	Working principle of IGBT	PPT slides & short video clip	CO1
7	IGBT	V-I characteristics and uses of IGBT	PPT slides & short video clip	CO1

8	SET	Concept of single electron transistor (SET)	PPT slides & short video clip	CO1
9	Nano-technology	Aspects of Nano-technology (concept only)	Chalkboard definition writing	CO1
10	Nano-technology	Aspects of Nano-technology (concept only)	PPT slides & short video clip	CO1
Unit 2: Thyristor Family Devices (Total Classes: 10)				
Class No.	**Topic**	**Subtopic**	**Teaching Aids/Activities**	**Course Objective**
11	SCR	Construction of SCR and Two transistor analogy of SCR	PPT slides & short video clip with derivation.	CO2
12	SCR	Types, working and characteristics of SCR, SCR mounting and cooling	PPT slides & short video clip.	CO2
13	LASCR	Symbol and construction, Operating principle And V-I characteristics	Chalk diagram on board by using graph	CO2
14	SCS & GTO	Symbol and construction, Operating principle And V-I characteristics	Chalk diagram on board by using graph	CO2
15	UJT	Symbol and construction, Operating principle And V-I characteristics	Chalk diagram on board by using graph	CO2
16	PUT	Symbol and construction, Operating principle And V-I characteristics	Chalk diagram on board by using graph	CO2
17	DIAC	Symbol and construction, Operating principle And V-I characteristics	Chalk diagram on board by using graph	CO2
18	TRIAC	Symbol and construction, Operating principle And V-I characteristics	Chalk diagram on board by using graph	CO2
19	Power electronics Circuit Protection	Over-voltage and over current protection of circuit	PPT slides & short video clip	CO2
20	Power electronics Circuit Protection	Snubber circuit and Crowbar circuit	PPT slides & short video clip	CO2

Unit 3: Turn-on and Turn-off Methods of Thyristors (Total Classes: 08)				
Class No.	**Topic**	**Subtopic**	**Teaching Aids/Activities**	**Course Objective**
21	SCR Turn-On methods	High Voltage thermal triggering and Illumination triggering	Chalkboard definition writing	CO3
22	SCR Turn-On methods	dv/dt triggering and Gate triggering	Chalkboard definition writing	CO3
23	Gate trigger circuits	Resistance and Resistance-Capacitance circuits	Chalkboard definition writing and it's derivation	CO3
24	SCR Turn-ON methods (Triggering method)	SCR triggering using UJT	PPT slides & short video clip	CO3
25	SCR Turn-ON methods (Triggering method)	PUT: Relaxation Oscillator and Synchronized UJT circuit	PPT slides & short video clip	CO3
26	SCR Turn-ON methods (Triggering method)	Pulse transformer and opto-coupler based triggering.	Chalkboard definition writing	CO3
27	SCR Turn-Off methods	Class A- Series resonant commutation circuit, Class B-Shunt Resonant commutation circuit, Class C-Complimentary Symmetry commutation circuit	PPT slides & short video clip	CO3
28	SCR Turn-Off methods	Class D-Auxiliary commutation, Class E-External pulse commutation, Class F-Line or natural commutation	PPT slides & short video clip	CO3

Unit 4: Phase Controlled Rectifiers (Total Classes: 10)				
Class No.	**Topic**	**Subtopic**	**Teaching Aids/Activities**	**Course Objective**
29	Phase Controlled Rectifiers	Phase control: firing angle, conduction angle.	PPT slides & short video clip	CO4
30	Single Phase Controlled Rectifiers	Single phase half controlled rectifier with R load	PPT slides & short video clip	CO4
31	Single Phase Controlled Rectifiers	Single phase half controlled rectifier with R-L load	PPT slides & short video clip	CO4
32	Single Phase Controlled Rectifiers	Single phase Full controlled rectifier with R load	PPT slides & short video clip	CO4

33	Single Phase Controlled Rectifiers	Single phase Full controlled rectifier with R-L load	PPT slides & short video clip	CO4
34	Single Phase Controlled Rectifiers	Single phase Midpoint controlled rectifier with R load	PPT slides & short video clip	CO4
35	Single Phase Controlled Rectifiers	Single phase Midpoint controlled rectifier with R-L load	PPT slides & short video clip	CO4
36	Freewheeling diode	effect of freewheeling diode	Chalkboard writing	CO4
37	Bridge controlled rectifier	Half bridge with common cathode and common anode, SCRs in one arm and diodes in another arm	Chalkboard writing	CO4
38	Bridge controlled rectifier	Full bridge with common cathode and common anode, SCRs in one arm and diodes in another arm	Chalkboard writing	CO4

Unit 5: Industrial Control Circuits (Total Classes: 07)

Class No.	Topic	Subtopic	Teaching Aids/Activities	Course Objective
39	Industrial Control Circuits	Applications of Burglar's alarm system and Battery charger using SCR	Chalkboard writing	CO5
40	Industrial Control Circuits	Application of Emergency light system	PPT slides & short video clip	CO5
41	Industrial Control Circuits	Application of Temperature controller using SCR	Chalkboard writing	CO5
42	Industrial Control Circuits	Illumination control/fan speed control TRIAC	PPT slides & short video clip	CO5
43	SMPS	Construction and Working of SMPS	Chalkboard writing	CO5
44	UPS	UPS: Offline and Online	PPT slides & short video clip	CO5
45	Circuit breaker	SCR based AC and DC circuit breakers	PPT slides & short video clip	CO5

Saiswarup Patel
Signature of the Faculty

17/1/26
Signature of the HOD
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