

# **DEPARTMENT OF ELECTRICAL ENGINEERING**

**BIT. Polytechnic, Balasore**

## **LESSON PLAN FOR ACADEMIC SESSION - 2025-26 POWER ELECTRONICS AND PLC**

Course Code : Th.5	Semester : 5th
Total Periods : 60 Periods	Examination : 3 Hours
Theory Periods : 4 P/Week	Internal Assessment : 20 Marks
Maximum Marks : 100	End Semester Examination : 80 Marks
Semester From Date : 14/07/2025	To Date : 15/11/2025 (Approx)
Name of Teaching Faculty:	Er. Sarbanidhi Dey (Elect)

WEEK	PERIOD	TOPIC
1st	1 <sup>st</sup>	<b>UNDERSTAND THE CONSTRUCTION AND WORKING OF POWER ELECTRONIC DEVICES</b> Construction, Operation, V-I characteristics & application of power diode, SCR
	2 <sup>nd</sup>	Construction, Operation, V-I characteristics & application of DIAC, TRIAC
	3 <sup>rd</sup>	Construction, Operation, V-I characteristics & application of Power MOSFET, GTO & IGBT
	4 <sup>th</sup>	Two transistor analogy of SCR.
2 <sup>nd</sup>	1 <sup>st</sup>	Gate characteristics of SCR.
	2 <sup>nd</sup>	Switching characteristic of SCR during turn on.
	3 <sup>rd</sup>	Switching characteristic of SCR during turn off.
	4 <sup>th</sup>	Turn on methods of SCR.
3 <sup>rd</sup>	1 <sup>st</sup>	Turn off methods of SCR (Line commutation and Forced commutation) Load Commutation
	2 <sup>nd</sup>	Resonant pulse commutation
	3 <sup>rd</sup>	Voltage and Current ratings of SCR.
	4 <sup>th</sup>	Protection of SCR Over voltage protection Over current protection
4 <sup>th</sup>	1 <sup>st</sup>	Gate protection
	2 <sup>nd</sup>	Firing Circuits General layout diagram of firing circuit
	3 <sup>rd</sup>	R firing circuits
	4 <sup>th</sup>	R-C firing circuit

5 <sup>th</sup>	1 <sup>st</sup>	UJT pulse trigger circuit Synchronous triggering (Ramp Triggering )
	2 <sup>nd</sup>	Design of Snubber Circuits
	3 <sup>rd</sup>	<b>UNDERSTAND THE WORKING OF CONVERTERS, AC REGULATORS AND CHOPPERS.</b> Controlled rectifiers Techniques (Phase Angle, Extinction Angle control), Single quadrant semi converter.
	4 <sup>th</sup>	Two quadrant full converter and dual Converter.
6 <sup>th</sup>	1 <sup>st</sup>	Working of single-phase half wave controlled converter with Resistive load.
	2 <sup>nd</sup>	Working of single-phase half wave controlled converter with R-L load & Understand need of freewheeling diode.
	3 <sup>rd</sup>	Working of single phase fully controlled converter with resistive load
	4 <sup>th</sup>	Working of single phase fully controlled converter with R-L load
7 <sup>th</sup>	1 <sup>st</sup>	Working of three-phase half wave controlled converter with Resistive load
	2 <sup>nd</sup>	Working of three phase fully controlled converter with resistive load
	3 <sup>rd</sup>	Working of single phase AC regulator.
	4 <sup>th</sup>	Working principle of step up & step down chopper & Control modes of chopper
8 <sup>th</sup>	1 <sup>st</sup>	Operation of chopper in all four quadrants.
	2 <sup>nd</sup>	Operation of chopper in all four quadrants.
	3 <sup>rd</sup>	<b>UNDERSTAND THE INVERTERS AND CYCLO-CONVERTERS</b> Introduction & Classification of inverters
	4 <sup>th</sup>	Explain the working of series inverter
9 <sup>th</sup>	1 <sup>st</sup>	Explain the working of parallel inverter
	2 <sup>nd</sup>	Explain the working of single-phase bridge inverter
	3 <sup>rd</sup>	Explain the basic principle of Cyclo-converter
	4 <sup>th</sup>	Explain the working of single-phase step up Cyclo-converter
10 <sup>th</sup>	1 <sup>st</sup>	Explain the working of single-phase step down Cyclo-converter
	2 <sup>nd</sup>	Applications of Cyclo-converter.
	3 <sup>rd</sup>	<b>UNDERSTAND APPLICATIONS OF POWER ELECTRONIC CIRCUITS</b> List applications of power electronic circuits
	4 <sup>th</sup>	List the factors affecting the speed of DC Motors
11 <sup>th</sup>	1 <sup>st</sup>	Speed control for DC Shunt motor using converter
	2 <sup>nd</sup>	Speed control for DC Shunt motor using chopper
	3 <sup>rd</sup>	List the factors affecting speed of the AC Motors.
	4 <sup>th</sup>	Speed control of Induction Motor by using AC voltage regulator
12 <sup>th</sup>	1 <sup>st</sup>	Speed control of induction motor by using converters and inverters (V/F control).
	2 <sup>nd</sup>	Working of UPS with block diagram.
	3 <sup>rd</sup>	Battery charger circuit using SCR with the help of a diagram.

	4 <sup>th</sup>	Basic Switched mode power supply (SMPS) - explain its working & applications
13 <sup>th</sup>	1 <sup>st</sup>	<b>PLC AND ITS APPLICATIONS</b> Introduction of Programmable Logic Controller(PLC) & Advantages of PLC
	2 <sup>nd</sup>	Different parts of PLC by drawing the Block diagram and purpose of each part of PLC
	3 <sup>rd</sup>	Applications of PLC & Ladder diagram
	4 <sup>th</sup>	Description of contacts and coils in the following states i)Normally open ii) Normally closed iii) Energized output iv)latched Output v) branching
14 <sup>th</sup>	1 <sup>st</sup>	Ladder diagrams for i) AND gate ii) OR gate and iii) NOT gate
	2 <sup>nd</sup>	Ladder diagrams for combination circuits using NAND,NOR, AND, OR and NOT
	3 <sup>rd</sup>	Timers-i)T ON ii) T OFF and iii)Retentive timer
	4 <sup>th</sup>	Counters-CTU, CTD
15 <sup>th</sup>	1 <sup>st</sup>	Ladder diagrams using Timers and counters & PLC Instruction set
	2 <sup>nd</sup>	Ladder diagrams for following (i) DOL starter and STAR-DELTA starter (ii) Stair case lighting (iii) Traffic light Control (iv) Temperature Controller
	3 <sup>rd</sup>	Special control systems- Basics DCS & SCADA systems
	4 <sup>th</sup>	Computer Control–Data Acquisition, Direct Digital Control System (Basics only)