

**GOVERNMENT POLYTECHNIC KORAPUT
DEPARTMENT OF ELECTRICAL ENGINEERING**

TH.5 POWER ELECTRONICS AND PLC

Name of the Course: Diploma in Electrical Engineering			
Faculty: Mahesh Kumar Biswal		DATE- 01/08/2023 TO-	
Course code:	Th.5	Semester:	5 th
Total Period:	60 Periods	Examination:	3 Hrs
Theory periods:	4 P / Week	Internal Assessment:	20
Tutorial:	-	End Semester Examination:	80
Maximum marks:	100		

VISION:

To create competent & industry ready Electrical Diploma Engineers with professional and social values to meet future challenges.

MISSION:

- To prepare diploma holders through “qualitative competency based education system” to compete with national requirement along with core values.
- To produce dynamic Electrical Engineers to serve the society and industry.
- To develop leadership qualities, communication skills, critical thinking and attitude for lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVES:

PEO1	Apply technical knowledge and skills learned in the field of Electrical Engineering to excel in professional and/or higher education.
PEO2	To provide students an excellent academic environment and make them aware the needs of Society and Industry to become a successful Professional/Entrepreneur.
PEO3	To engage in lifelong learning, career enhancement to adopt emerging technologies

COURSE OUTCOMES:

CO1	Understand construction, working and applications of power electronic devices.
CO2	Analyze controlled converters, ac regulators, choppers, inverters and cyclo-converters.
CO3	Employ power electronic circuits for various applications in real time.
CO4	Use programmable logic controller for various applications.



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TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1.	Understand The Construction And Working Of Power Electronic Devices	18
2.	Understand The Working Of Converters, Ac Regulators And Choppers.	12
3.	Understand The Inverters And Cyclo-Converters	08
4.	Understand Applications Of Power Electronic Circuits	10
5.	PLC And Its Applications	12
Total		60

LESSON PLAN

Week	Day	Theory topic
1 st	1 st	Understand the construction and working of power electronic devices: Introduction
	2 nd	Construction, Operation, V-I characteristics & applications of Power diode
	3 rd	Construction, Operation, V-I characteristics & applications of SCR
	4 th	Construction, Operation, V-I characteristics & applications of DIAC, TRIAC
2 nd	1 st	Construction, Operation, V-I characteristics & applications of Power MOSFET
	2 nd	Construction, Operation, V-I characteristics & applications of GTO
	3 rd	Construction, Operation, V-I characteristics & applications of IGBT
	4 th	Two transistor analogy of SCR. Voltage and Current ratings of SCR
3 rd	1 st	Gate characteristics of SCR. Switching characteristic of SCR during turn on and turn off.
	2 nd	Turn on methods of SCR.
	3 rd	Turn off methods of SCR (Line commutation and Forced commutation)
	4 th	Load Commutation Resonant pulse commutation
4 th	1 st	Protection of SCR, Over voltage protection
	2 nd	Over current protection, Gate protection
	3 rd	Firing Circuits: General layout diagram of a firing circuit
	4 th	R firing circuit, R-C firing circuit
5 th	1 st	UJT pulse trigger circuit, Synchronous triggering (Ramp Triggering)
	2 nd	Design of Snubber Circuits
	3 rd	Understand the working of converters, AC regulators and choppers: Introduction
	4 th	Controlled rectifier techniques (Phase Angle, Extinction Angle control).
6 th	1 st	Single quadrant semi converter
	2 nd	Two quadrant full converter and dual Converter
	3 rd	Working of single-phase half wave controlled converter with Resistive and R-L loads.
	4 th	Understand need of freewheeling diode.
7 th	1 st	Working of single phase fully controlled converter with resistive and R-L loads.
	2 nd	Working of three-phase half wave controlled converter with Resistive load.
	3 rd	Working of three-phase fully controlled converter with resistive load.
	4 th	Working of single phase AC regulator.

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8 th	1 st	Working principle of step up & step down chopper.
	2 nd	Control modes of chopper Operation of chopper in all four quadrants.
	3 rd	Understand the inverters and Cyclo-converters: Classify inverters.
	4 th	Explain the working of series inverter.
9 th	1 st	Explain the working of parallel inverter.
	2 nd	Explain the working of single-phase bridge inverter.
	3 rd	Explain the basic principle of Cyclo-converter.
	4 th	Explain the working of single-phase step up Cyclo-converter.
10 th	1 st	Explain the working of single-phase step down Cyclo-converter.
	2 nd	Applications of Cyclo-converter.
	3 rd	Understand applications of power electronic circuits: List applications of power electronic circuits.
	4 th	List the factors affecting the speed of DC Motors.
11 th	1 st	Speed control for DC Shunt motor using converter.
	2 nd	Speed control for DC Shunt motor using chopper.
	3 rd	List the factors affecting speed of the AC Motors.
	4 th	Speed control of Induction Motor by using AC voltage regulator.
12 th	1 st	Speed control of induction motor by using converters and inverters (V/F control)
	2 nd	Working of UPS with block diagram.
	3 rd	Battery charger circuit using SCR with the help of a diagram.
	4 th	Basic Switched mode power supply (SMPS) - explain its working & applications
13 th	1 st	Plc and its applications Introduction of Programmable Logic Controller(PLC) Advantages of PLC
	2 nd	Different parts of PLC by drawing the Block diagram and purpose of each part of PLC.
	3 rd	Applications of PLC
	4 th	Ladder diagram Description of contacts and coils in the following states: (i) Normally open ii) Normally closed iii) Energized output iv)latched Output v)branching
14 th	1 st	Ladder diagrams for i) AND gate ii) OR gate and iii) NOT gate. Ladder diagrams for combination circuits using NAND.NOR, AND, OR and NOT
	2 nd	Timers-i)T ON ii) T OFF and iii)Retentive timer Counters-CTU, CTD
	3 rd	Ladder diagrams using Timers and counters PLC Instruction set
	4 th	Ladder diagrams for following (i) DOL starter and STAR-DELTA starter (ii) Stair case lighting
15 th	1 st	(iii) Traffic lightControl (iv) Temperature Controller
	2 nd	Special control systems- Basics DCS & SCADA systems
	3 rd	Computer Control–Data Acquisition, Direct Digital Control System (Basics only)
	4 th	Miscellaneous

M. Anil Kumar
01/08/23
Signature of faculty concerned

A. S. B.
01/08/23
H.O.D. Electrical