

**GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING****Department of Electrical Engineering****Lesson Plan**

<b>Subject : POWER ELECTRONICS AND PLC</b>			
<b>Discipline: Electrical Engineering</b>		<b>Name of the Faculty: Soumya Shyamalai Mahapatra</b>	
<b>Course Code:</b>	<b>TH-5</b>	<b>Semester:</b>	<b>5<sup>TH</sup></b>
<b>Total Periods:</b>	<b>60</b>	<b>Examination:</b>	<b>2022(Winter)</b>
<b>Theory Periods:</b>	<b>4P/W</b>	<b>Class Test:</b>	<b>20</b>
<b>Maximum Marks:</b>	<b>100</b>	<b>End Semester Examination:</b>	<b>80</b>

<b>Week</b>	<b>Periods in week</b>	<b>Theory Topics</b>
<b>1<sup>st</sup></b>	1 <sup>st</sup>	1.1 Construction, Operation, V-I characteristics & application of power diode, SCR, DIAC, TRIAC, Power MOSFET, GTO & IGBT
	2 <sup>nd</sup>	1.2 Two transistor analogy of SCR.
	3 <sup>rd</sup>	1.3 Gate characteristics of SCR.
	4 <sup>th</sup>	1.4 Switching characteristic of SCR during turn on and turn off.
<b>2<sup>nd</sup></b>	1 <sup>st</sup>	1.5 Turn on methods of SCR.
	2 <sup>nd</sup>	1.6 Turn off methods of SCR (Line commutation and Forced commutation) 1.6.1 Load Commutation 1.6.2 Resonant pulse commutation
	3 <sup>rd</sup>	1.7 Voltage and Current ratings of SCR.
	4 <sup>th</sup>	1.8 Protection of SCR 1.8.1 Over voltage protection 1.8.2 Over current protection 1.8.3 Gate protection
<b>3<sup>rd</sup></b>	1 <sup>st</sup>	1.9 Firing Circuits 1.9.1 General layout diagram of firing circuit 1.9.2 R firing circuits 1.9.3 R-C firing circuit 1.9.4 UJT pulse trigger circuit 1.9.5 Synchronous triggering (Ramp Triggering )
	2 <sup>nd</sup>	1.10 Design of Snubber Circuits
	3 <sup>rd</sup>	2.1 Controlled rectifiers Techniques(Phase Angle, Extinction Angle control), Single quadrant semi converter, two quadrant full converter and dual Converter.
	4 <sup>th</sup>	2.2 Working of single-phase half wave controlled converter with Resistive and R-L loads
<b>4<sup>th</sup></b>	1 <sup>st</sup>	. 2.3 Understand need of freewheeling diode
	2 <sup>nd</sup>	. 2.4 Working of single phase fully controlled converter with resistive and R- L loads
	3 <sup>rd</sup>	2.5 Working of three-phase half wave controlled converter with Resistive load
	4 <sup>th</sup>	2.6 Working of three phase fully controlled converter with resistive load.
<b>5<sup>th</sup></b>	1 <sup>st</sup>	. 2.7 Working of single phase AC regulator. 2.8 Working principle of step up & step down chopper
	2 <sup>nd</sup>	2. 2.10 Operation of chopper in all four quadrants 9 Control modes of chopper
	3 <sup>rd</sup>	3.1 Classify inverters.
	4 <sup>th</sup>	3.2 Explain the working of series inverter. 3.3 Explain the working of parallel inverter
<b>6<sup>th</sup></b>	1 <sup>st</sup>	3.4 Explain the working of single-phase bridge inverter. V- Semester Electrical
	2 <sup>nd</sup>	3.5 Explain the basic principle of Cyclo-converter
	3 <sup>rd</sup>	3.6 Explain the working of single-phase step up & step down Cyclo-converter
	4 <sup>th</sup>	... 3.7 Applications of Cyclo-converter

<b>7TH</b>	1 <sup>st</sup>	4.1 List applications of power electronic circuits.
	2 <sup>nd</sup>	4.2 List the factors affecting the speed of DC Motors.
	3 <sup>rd</sup>	4.3 Speed control for DC Shunt motor using converter.
	4 <sup>th</sup>	4.4 Speed control for DC Shunt motor using chopper.
<b>8TH</b>	1 <sup>st</sup>	4.5 List the factors affecting speed of the AC Motors.
	2 <sup>nd</sup>	4.6 Speed control of Induction Motor by using AC voltage regulator.
	3 <sup>rd</sup>	4.7 Speed control of induction motor by using converters and inverters (V/F control).
	4 <sup>th</sup>	4.8 Working of UPS with block diagram.
<b>9TH</b>	1 <sup>st</sup>	4.9 Battery charger circuit using SCR with the help of a diagram.
	2 <sup>nd</sup>	4.10 Basic Switched mode power supply (SMPS) - explain its working & applications
	3 <sup>rd</sup>	5.1 Introduction of Programmable Logic Controller(PLC)
	4 <sup>th</sup>	5.2 Advantages of PLC
<b>10TH</b>	1 <sup>st</sup>	5.3 Different parts of PLC by drawing the Block diagram and purpose of each part of PLC.
	2 <sup>nd</sup>	5.4 Applications of PLC
	3 <sup>rd</sup>	5.5 Ladder diagram.
	4 <sup>th</sup>	5.6 Description of contacts and coils in the following states i) Normally open ii) Normally closed iii) Energized output iv) latched Output v) branching
<b>11TH</b>	1 <sup>st</sup>	5.7 Ladder diagrams for i) AND gate ii) OR gate and iii) NOT gate.
	2 <sup>nd</sup>	5.8 Ladder diagrams for combination circuits using NAND, NOR, AND, OR and NOT
	3 <sup>rd</sup>	5.9 Timers-i) T ON ii) T OFF and iii) Retentive timer
	4 <sup>th</sup>	5.10 Counters-CTU, CTD
<b>12TH</b>	1 <sup>st</sup>	5.11 Ladder diagrams using Timers and counters
	2 <sup>nd</sup>	5.12 PLC Instruction set
	3 <sup>rd</sup>	5.13 Ladder diagrams for following (i) DOL starter and STAR-DELTA starter (ii) Stair case lighting (iii) Traffic light Control (iv) Temperature Controller
	4 <sup>th</sup>	5.14 Special control systems- Basics DCS & SCADA systems
<b>13TH</b>	1 <sup>st</sup>	5.15 Computer Control–Data Acquisition, Direct Digital Control System (Basics only)
	2 <sup>nd</sup>	Revisions
	3 <sup>rd</sup>	Revisions
	4 <sup>th</sup>	Revisions

