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| **JHARSUGUDA ENGINEERING SCHOOL,JHARSUGUDA TH.5 POWER ELECTRONICS AND PLC BY Smt. BINAY BHUSAN NANDA****LESSON PLAN SESSION-2023-24** |
| **Sl.No.** | **Chapter** | **Hours** | **WEEK** | **Lecture No.** | **Topic to be covered** |
| 1 | Chapter-1 | 18 |  1 | **UNDERSTAND THE CONSTRUCTION AND WORKING OF POWER ELECTRONIC DEVICES** |
| 1 | Construction, Operation, V-I characteristics & application of power diode, SCR, DIAC,TRIAC, Power MOSFET,GTO &IGBT  |
| 1 |  Two transistor analogy of SCR. |
| 1 |  Gate characteristics of SCR. |
| 1 | Switching characteristic of SCR during turn on and turn off.  |
| 2 | 1 | Turn on methods of SCR.  |
| 3 | Turn off methods of SCR (Line commutation and Forced commutation) Load Commutation Resonant pulse commutation  |
| 3 | 1 | Voltage and Current ratings of SCR. |
| 3 | Protection of SCR Over voltage protection Over current protection Gate protection |
| 4 | 4 | Firing Circuits General layout diagram of firing circuit R firing circuits R-C firing circuit UJT pulse trigger circuit  |
| 5 | 1 | Synchronous triggering (Ramp Triggering ) |
| 1 |  Design of Snubber Circuits |
| 2 | Chapter-2 | 12 |  5 | **UNDERSTAND THE WORKING OF CONVERTERS, AC REGULATORS AND CHOPPERS.** |
| 2 | Controlled rectifiers Techniques(Phase Angle, Extinction Angle control), Single quadrant semi converter. |
| 6 | 1 | Two quadrant full converter and dual Converter  |
| 1 |  Working of single-phase half wave controlled converter with Resistive and R-L loads.  |
| 1 | Understand need of freewheeling diode. |
| 1 | Working of single phase fully controlled converter with resistive and R- L loads.  |
| 7 | 1 | Working of three-phase half wave controlled converter with Resistive load  |
| 1 |  Working of three phase fully controlled converter with resistive load.  |
| 1 | Working of single phase AC regulator. |
| 1 | Working principle of step up & step down chopper. |
| 8 | 1 |  Control modes of chopper  |
| 1 | Operation of chopper in all four quadrants. |

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| 3 | Chapter-3 | 8 |  8 | **UNDERSTAND THE INVERTERS AND CYCLO-CONVERTERS** |
| 1 |  Classify inverters.  |
|  Explain the working of series inverter. |
| 1 | Explain the working of parallel inverter |
| 9 | 1 | Explain the working of single-phase bridge inverter. |
| 1 | Explain the basic principle of Cyclo-converter.  |
| 2 |  Explain the working of single-phase step up & step down Cyclo-converter. |
| 10 | 1 | Applications of Cyclo-converter. |
| 4 | Chapter-4 | 10 |  10 | **UNDERSTAND APPLICATIONS OF POWER ELECTRONIC CIRCUITS** |
| 1 |  List applications of power electronic circuits.  |
| 1 | List the factors affecting the speed of DC Motors. |
| 1 | Speed control for DC Shunt motor using converter |
| 11 | 1 |  Speed control for DC Shunt motor using chopper. |
| 1 | List the factors affecting speed of the AC Motors. |
| 1 | Speed control of Induction Motor by using AC voltage regulator.  |
| 1 | Speed control of induction motor by using converters and inverters (V/F control).  |
| 12 | 1 | Working of UPS with block diagram.  |
| 1 | Battery charger circuit using SCR with the help of a diagram.  |
| 1 | Basic Switched mode power supply (SMPS) - explain its working & applications |
| 5 | Chapter-5 | 12 |  12 | **PLC AND ITS APPLICATIONS** |
| 1 | Introduction of Programmable Logic Controller(PLC) |
| Advantages of PLC  |
| 13 | 1 |  Different parts of PLC by drawing the Block diagram and purpose of each part of PLC.  |
|  Applications of PLC  |
| 1 |  Ladder diagram  |
| 1 | Description of contacts and coils in the following states i)Normally open ii) Normally closed iii) Energized output iv)latched Output v) branching |
| 1 | Ladder diagrams for i) AND gate ii) OR gate and iii) NOT gate. |
| 14 | 1 | Ladder diagrams for combination circuits using NAND,NOR, AND, OR and NOT  |
| 1 |  Timers-i)T ON ii) T OFF and iii)Retentive timer |
| 1 | Counters-CTU, CTD  |
| 1 |  Ladder diagrams using Timers and counters |
| 15 | 1 |  PLC Instruction set  |
| 1 | Ladder diagrams for following (i) DOL starter and STAR-DELTA starter (ii) Stair case lighting (iii) Traffic light Control (iv) Temperature Controller  |
| 1 | Special control systems- Basics DCS & SCADA systems  |
|  Computer Control–Data Acquisition, Direct Digital Control System (Basics only) |