**GOVERNMENT POLYTECHNIC NUAPADA**

**DEPARTMENT OF ELECTRICAL ENGINEERING**

SUBJECT: TH-5: POWER ELECTRONICS AND PLC

CONCERNED FACULTY: ER. BARADA PRASAD SAHOO

SEM: 5TH SEMESTER

SESSION- 2022-23

SEMESTER FROM DT: 15-09-2022 TO DT: 22-12-2022

NO. OF WEEKS: 14

NO. OF DAYS/ PER WEEK CLASS ALLOTED: 4L PERIODS/WEEK

**LESSON PLAN**

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| WEEK | DATE | MODULE | THEORY / PRACTICAL TOPICS | CLASS DAY | REMARKS |
|  |  | 01 | UNDERSTAND THE CONSTRUCTION AND WORKING OF POWER | 18 Periods |  |
| 1ST &  2ND | 16/19/20/21/23-  09-2022 | 1.1 Introduction to Power Electronics circuits, construction,  Operation, V-I characteristics & application of  power diode, SCR, DIAC, TRIAC, Power  MOSFET, GTO & IGBT | 5 |  |
| 3RD | 26-09-2022 | 1.2 Two transistor model of SCR | 1 |  |
| 27-09-2022 | 1.3 Gate characteristics of SCR | 1 |  |
| 28/30-09-2022 | 1.4 switching char. Of SCR during Turn ON and turn OFF | 2 |  |
| 4TH | 10/11/12-10-  2022 | 1.5 turn ON method of SCR | 3 |  |
| 1.6 turn OFF methods of SCR  1.6.1 Load commutation  1.6.2 Resonant pulse commutation |  |
| 14-10-2022 | 1.7 voltage and current ratings of SCR | 1 |  |
| 5TH /6TH | 17/18-10-2022 | 1.8 protection of SCR  1.8.1 over voltage protection  1.8.2 over current protection  1.8.3 gate protection | 2 |  |
| 19/21-10-2022  25-10-2022 | 1.9 firing circuit  1.9.1 general layout diagram of firing circuit  1.9.2 R firing circuit  1.9.3 R-C firing circuit  1.9.4 UJT pulse triggering circuit  1.9.5 Synchronous triggering (Ramp triggering) | 3 |  |
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| 6TH |  | 02 | UNDERSTAND THE WORING OF  CONVERTERS, AC REGULATORS AND  CHOPPERS | 12 Periods |  |
| 26-10-2022 | 2.1 controlled rectifiers techniques (phase angle, extinction angle control), single quadrant semiconverter, two quadrant full converter and dual converter | 1 |  |
| 28-10-2022  31-10-2022 | 2.2 working of single-phase half-wave-controlled converter with R load and RL load | 2 |  |
| 7TH | 01-11-2022 | 2.3 Understand need of freewheeling diode | 1 |  |
| 02-11-2022  04-11-2022 | 2.4 working of single-phase fully controlled converter with R load, RL load | 2 |  |
| 07-11-2022 | 2.5 working of three-phase half wave-controlled converter with R load | 1 |  |
| 09-11-2022 | 2.6 working of three phase fully controlled converter with R load | 1 |  |
| 8TH | 11-11-2022 | 2.7 working of single-phase AC regulator | 1 |  |

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|  | 14-11-2022 |  | 2.8 working principle of step-up and step-down converter | 1 |  |
| 15-11-2022 | 2.9 control modes of chopper | 1 |  |
| 16-11-2022 | 2.10 operation of chopper in all four quadrants | 1 |  |
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| 9TH |  | 03 | UNDERSTAND THE INVERTERS AND CYCLO-CONVERTERS | 08 Periods |  |
| 18-11-2022 | 3.1 classify inverters | 1 |  |
| 21-11-2022 | 3.2 explain the working of series inverter | 1 |  |
| 22-11-2022 | 3.3 explain the working of parallel inverter | 1 |  |
| 23-11-2022 | 3.4 explain the working of single-phase bridge inverter | 1 |  |
| 25-11-2022 | 3.5 explain the basic principle of cyclo-converter | 1 |  |
| 10TH | 28/29-11-2022 | 3.6 explain the working of single-phase step-up & step-down cyclo-converter | 2 |  |
| 30-11-2022 | 3.7 application of cyclo-converter | 1 |  |
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| 04 | UNDERSTAND APPLICATION OF POWER ELECTRONICS CIRCUIT | 10 Periods |  |
| 4.1 list application of power electronics circuit | 1 |  |
| 02-12-2022 | 4.2 List the factor affecting the speed of DC motors |  |
| 4.3 speed control for DC shunt motor using converter | 1 |  |
| 4.4 speed control for DC shunt motor using chopper | 1 |  |
| 05-12-2022 | 4.5 List of factors affecting speed of the AC motors | 1 |  |
| 4.6 speed control of induction motor by using AC voltage regulator | 1 |  |
| 4.7 speed control of induction motor by using converters and Inverter | 2 |  |
| 11TH | 06-12-2022 | 4.8 working of UPS with block diagram | 1 |  |
| 4.9 battery charger circuit using SCR with the help of diagram | 1 |  |
| 4.10 basic switched mode power supply (SMPS)- explain its working & Applications | 1 |  |
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| 07-12-2022 | 05 | PLC AND ITS APPLICATIONS | 12 Periods |  |
| 09-12-2022 | 5.1 introduction to Programmable Logic  Controller (PLC) | 1 |  |
| 5.2 advantages of PLC |  |
| 5.3 different parts of PLC by drawing the block diagram and purpose of each part of PLC | 1 |  |
| 5.4 application of PLC |  |
| 12TH | 12-12-2022 | 5.5 ladder diagram | 1 |  |
| 13-12-2022 | 5.6 description of contacts & coils in the following states  5.6.1 normally open  5.6.2 normally closed  5.6.3 energized output  5.6.4 latched output  5.6.5 branching | 1 |  |
| 14-12-2022 | 5.7 ladder diagram  5.7.1 AND gate  5.7.2 OR gate  5.7.3 NOT gate | 1 |  |
|  | 16-12-2022 | 5.8 ladder diagram for combination circuit using  NAND, NOR, AND, OR, NOT | 1 |  |

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| 13TH |  |  | 5.9 Timers  5.9.1 T-ON  5.9.2 T-OFF  5.9.3 Retentive timer | 1 |  |
| 5.10 counters- CTU, CTD | 1 |  |
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|  | 19-12-2022 | 06 | 5.11 Ladder diagrams using Timers and counters |  |  |
| 5.12 PLC instruction set | 2 |  |
| 5.13 ladder diagram for following  5.13.1 DOL starter & STAR\_DELTA starter  5.13.2 Stair case lighting  5.13.3 Traffic light control  5.13.4 Temperature controller |  |
| 5.14 special control systems- Basic DCS &  SCADA systems | 1 |  |
| 20-12-2022 | 5.15 Computer control- Data Acquisition, Direct  Digital control system (Basics only) | 1 |  |
| 14TH | 21-12-2022 |  | REVISION CLASSES Q&A DISCUSSION | 1 |  |