**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  |   |
|   |   |   |   |   |   |
| 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  |   |
|   |   |   |   |   |   |
| 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  |   |
|   |   |   |   |
| 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  |   |
|   |   |   |   |   |
| 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  |   |