# POWER ELECTRONICS LAB

| Course Code | 23EE3551 | Year | III | Semester(s) | I |
|---|---|---|---|---|---|
| Course Category | Professional Core | Branch | EEE | Course Type | Lab |
| Credits | 1.5 | L-T-P | 0-0-3 | Prerequisites | |
| Continuous Internal Evaluation: | 30 | Semester End Evaluation: | 7.p0 | Total Marks: | 100 |

| Course Outcomes | |
|---|---|
| **Upon successful completion of the course, the student will be able to** | |
| CO1 | **Understand** the characteristics and switching behavior of power semiconductor devices such as SCR, MOSFET, and IGBT used in power electronic circuits. (L2) |
| CO2 | **Apply** various triggering and control techniques to operate AC-DC converters, AC voltage regulators, and cycloconverters for different load conditions. (L3) |
| CO3 | **Apply** the principles of operation of DC-DC converters and single-phase/three-phase inverters to convert and control power efficiently. (L3) |
| CO4 | **Analyze** the performance of power electronic converters and inverters under different conduction modes and load types using waveform observations and measurements. (L4) |
| CO5 | **Conduct experiments as a team or individual, Prepare clear and well-organized lab reports** with circuit diagrams, procedures, results, and conclusions. |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | 2 | | | | | | | 2 | 2 | 2 |
| CO2 | 3 | 2 | | 3 | 2 | | | | | | 3 | 3 | 2 |
| CO3 | 3 | 2 | | 3 | 2 | | | | | | 3 | 3 | 2 |
| CO4 | 2 | 3 | | 3 | 2 | | | | | | 3 | 3 | 2 |
| CO5 | | | | | | | | 3 | 3 | | | | |

**Any 10 of the following experiments are to be conducted:**

| Syllabus | | |
|---|---|---|
| Exp. No. | Contents | Mapped CO |
| 1 | Characteristics of SCR - Power MOSFET & Power IGBT. | CO1<br>CO5 |
| 2 | R, RC & UJT firing circuits for SCR. | CO1<br>CO2<br>CO5 |
| 3 | Single -Phase semi-converter with R & RL loads. | CO2<br>CO4<br>CO5 |
| 4 | Single -Phase full-converter with R & RL loads. | CO2<br>CO4 |

| | | |
|---|---|---|
| | | CO5 |
| 5 | Three- Phase full-converter with R & RL loads. | CO2<br>CO4<br>CO5 |
| 6 | Single-phase dual converter in circulating current & non-circulating current mode of operation. | CO2<br>CO4<br>CO5 |
| 7 | Single-Phase AC Voltage Regulator with R & RL Loads. | CO2<br>CO4<br>CO5 |
| 8 | Single-phase step down Cycloconverter with R & RL Loads. | CO2<br>CO4<br>CO5 |
| 9 | Boost converter in Continuous Conduction Mode operation. | CO3<br>CO4<br>CO5 |
| 10 | Buck converter in Continuous Conduction Mode operation. | CO3<br>CO4<br>CO5 |
| 11 | Single -Phase square wave bridge inverter with R & RL Loads. | CO3<br>CO4<br>CO5 |
| 12 | Single - Phase PWM inverter. | CO3<br>CO4<br>CO5 |
| 13 | Three-phase bridge inverter with $120^0$ and $180^0$ conduction mode. | CO3<br>CO4<br>CO5 |
| 14 | SPWM control of Three-phase bridge inverter | CO3<br>CO4<br>CO5 |

**Learning Resources**

**Text Books:**


1. Ned Mohan, Tore M Undeland, William P Robbins, "Power Electronics: Converters, Applications and Design" by John Wiley & Sons, 2002.
2. M. H. Rashid, "Power Electronics: Circuits, Devices and Applications", Prentice Hall of India, 2nd edition, 2017.
3. L. Umanand, "Power Electronics: Essentials & Applications", Wiley Pvt. Limited, India, 2009


Reference Books:


1. Philip T.Krein. "Elements of Power Electronics", Oxford University Press; Second edition, 2014.
2. P. S. Bhimbra, "Power Electronics", Khanna Publishers.
3. G. K. Dubey, S. R. Doradla, A. Joshi and R. M. Sinha, "Thyristorised Power Controllers", New Age International (P) Limited Publishers, 1996.
4. Daniel W. Hart, "Power Electronics", Mc Graw Hill, 2011.