NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering
Semester – IV

L	T	P	C
0	0	4	2

Course Code	**2EE406**
Course Title	**Power Electronics Laboratory**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. illustrate the characteristics and operation of various switching devices
2. suggest triggering methods for various converters
3. analyze and implement converter circuits by using suitable power semiconductor devices
4. evaluate various performance parameters of converters
5. apply suitable speed control method to various power electronic converter controlled dc motors

A minimum of 20 experiments / simulations based on following topics (but not limited to) will be conducted in this course:

- SCR characteristics and triggering circuits
- Single-phase and three-phase half-controlled as well as fully-controlled bridge rectifiers with R, R-L and R-L-E loads
- Dual-converter with and without circulating currents
- Working of TRIAC and its triggering circuits
- Characteristics and triggering of MOSFET and IGBT
- Applications of pulse transformer and optocouplers for isolation purposes
- Operation of multi-pulse converters and its importance in power quality improvement
- Working of ac to ac converters (ac voltage controllers and cycloconverters) with R and R-L loads
- Operation of dc to dc converters (choppers)
- Design and testing of buck, boost, buck-boost, push-pull, full-bridge converters
- Working of single-phase and three-phase inverters
- Operation of Uninterrupted Power Supply (UPS)
- Concept of power factor correction devices
- Speed control and braking of dc electric motors
- Functioning of switched mode power supplies
- Generation of dead-band for inverter leg
- Different PWM schemes and their closed-loop control
- PWM rectifiers
- Solar and battery powered drives
- Power electronic transformer.

Suggested Readings:

1. Muhammd H. Rashid: Power Electronics: Circuits, Devices and Applications, 3rd Edition, Pearson Education, New Delhi, 2004.
2. Ned Mohan, Tore M. Undeland and William P. Robbins: Power Electronics: Converters, Applications and Design, John Wiley & Sons, Inc., New York, 2003.
3. L Umanand: Power Electronics, Essentials & Applications, Wiley India, 2011.
4. M. S. Jamil Asghar: Power Electronics, Prentice-Hall of India Pvt. Ltd., New Delhi, 2005.
5. M. D. Singh and K. B. Khanchandani: Power Electronics, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2001.
6. G. K. Dubey, S. R. Doradla, A. Joshi, R. M. K. Sinha: Thyristorized Power Controllers, New Age International, Delhi 1986.
7. B. Jayant Baliga: Power Semiconductor Devices, Thompson Course Technology, Singapore, 2004.
8. P. S. Bhimbra: Power Electronics, Khanna Publishers, New Delhi, 2001.
9. C. W. Lander: Power Electronics, McGraw-Hill, UK, 1981.
10. P. C. Sen: Modern Power Electronics, S. Chand, New Delhi, 2005.
11. Mukund R. Patel: Wind and Solar Power Systems, CRC Press, Florida, 2000
12. Chetan Singh Solanki: Solar Photovoltaics: Fundamentals, Technologies and Applications, Prentice Hall, New Delhi, 2009
13. Joseph Vithayathil: Power Electronics, Principles and Applications, Indian Edition, McGraw- Hill, 5th Edition, 2013.
14. Various IEEE/IET Papers & Various Product Literature

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards