Course Title	**Power Electronics**
Course Code	**EE5303**
No. of Credit Hrs (Lecture + Tutorial + Lab)	**3 (2+0+1)**
No. of Contact Hrs (Lecture + Tutorial + Lab)	**4 (2+0+2)**
Level-Year	**10–5**
Prerequisite (if any)	**EE3404**

1) Course Objectives:

This course aims at providing the basic knowledge required by practicing engineers for dealing with power electronics in order to:

1. Acquire information concerning the different types of power converters.
2. Enhance thought about the main methods of AC regulators.
3. Improve knowledge for the main difference between different types of dc chopper circuits.
4. Help dealing with the different types of inverter circuits and their applications.
5. Provide experimental foundation for the theoretical concepts such as power converters and rectifiers power switches.

2) Expected Learning Outcomes:

1. **Differentiate and explain** the operating principles of AC–DC converters, AC regulators, and cycloconverters. **PLO1 [1]**
2. **Analyze and evaluate** the advantages and disadvantages of various chopper circuit regulators. **PLO3 [6]**
3. **Apply** protection methods for control units in power electronic systems. **PLO1 [1]**
4. **Implement and utilize** mathematical formulations for analyzing three-phase inverter operation. **PLO4**
5. **Design and create** appropriate firing circuits for power converters and inverters. **PLO2 [2]**
6. **Interpret experimental results** and communicate waveform analysis effectively through structured laboratory reports. **PLO8 [3]**

7. Course Contents

1. AC to DC Converters - AC regulators – Cycle Converters.
2. Chopper Circuits: Buck Regulator, Boost Regulator, Buck-Boost Regulators, and Cuk Regulators.
3. Converter Operation - Pulse Circuits.
4. Three Phase Voltage Source Inverter - Stepped Inverters – Six Step Inverter - PWM Inverters.
5. Current Source Inverters.
6. Voltage Source Inverters.
7. Firing Circuits.
8. Control Units – Protection.
9. Heat Sinks – Isolation

8. Lab Content

1. Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents.
2. Find V-I characteristics of TRIAC and DIAC.
3. Find output characteristics of MOSFET and IGBT.
4. Study and test 1-phase rectifier with R and RL loads.
5. Study and obtain waveforms of single-phase half wave-controlled rectifier with and without filters.

6. MATLAB/ PSPICE Simulation of dc to dc step up / down chopper.
7. MATLAB/ PSPICE Simulation of PWM bridge invertor of r-l load

9. Teaching Methods:

- Lectures and Discussion
- Videos
- Self-learning
- Laboratory demonstrations

10. Mode of Evaluation: Course Assessment Methods

- Quizzes , Assignment, Homeworks, Reports, Presentations etc.
- Lab Work
- Mid Exam
- Final Exam

Evaluation

No	Assessment Activities *	Percentage
1.	Assignments/Quizzes/HomeWorks/Mini-Projects/Presentations/Reports+Quizzes	15%
2.	Mid Exam	25%
3.	Lab/Tutorial (Lab Exam)	10%
4.	Lab/Tutorial (Lab Reports)	10%
5.	Final Exam	40%

11. Textbook(s):

- M.H. Rashid, Power Electronics.

12. References:

- Williams, “Power Electronics and Drive Applications”.
- “Power Electronics, Circuits, Devices and Applications", Muhammad H. Rashid, Second edition.
- Laboratory experimental manuals.