

# School of Electrical, Electronics and Communication Engineering

Course Code : BTEE3011

Course Name: Power Electronics



## INTRODUCTION

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UNIVERSITY

*Name of the Faculty: Saravanan D*

*Program Name: B.Tech-EE/EEE*

# School of Electrical, Electronics and Communication Engineering

Course Code : BTEE3011

Course Name: Power Electronics

<b>Name of The Course</b>	<b>Power Electronics</b>			
<b>Course Code</b>	BTEE3011			
<b>Prerequisite</b>	BTEE2002			
<b>Co-requisite</b>	BEC101			
<b>Anti-requisite</b>				
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Fall 2020-21

Program- B.Tech

Branch-EE-V Semester

-EEE-VII Semester

Course Coordinator

Mr. Saravanan D

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*Program Name: B.Tech-EE/EEE*

# School of Electrical, Engineering

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Course Name: Power Electronics

## Course Objectives

1. The field of power electronics encompasses the application of fundamental concepts in several disciplines: electronic devices and circuits, variable speed drives and control systems.
2. To familiarize the students to the physics of power device, principle of operation, design and synthesis of different power conversion circuits and their applications.
3. To provide strong foundation for further study of power electronic circuits and systems and create base to apply the power converters in relevant field.

## Course Outcomes

On completion of this course, the students will be able to

<b>CO1</b>	<b>Describe the operation of various high-power switching devices and compare its performance.</b>
<b>CO2</b>	Design and analyse the thyristor-based Chopper and AC-DC power converters.
<b>CO3</b>	Formulate and analyse the configuration and its performance of Power converters.
<b>CO4</b>	Apply and develop the power circuit configurations to modify the AC Voltages.
<b>CO5</b>	Develop and analyse the thyristor based-inverter configurations and select the relevant switching mechanisms.
<b>CO6</b>	Identify the role power converters in the improvement of energy usage efficiency.

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## Suggested Reading

1. M.H. Rashid, “ Power Electronics: Circuits, Devices & Applications”, Prentice Hall of India, Ltd. 3rd Edition, 2004
2. V.R. Moorthy, “ Power Electronics : Devices, Circuits and Industrial Applications” Oxford, University Press, 2007.
3. M.D.Singh & K.B.Khanchandani, “Power Electronics”, Tata McGraw Hill publishing company, 1989
4. M.S. Jamil Asghar, “Power Electronics” Prentice Hall of India Ltd., 2004.
5. Chakrabarti & Rai, “Fundamentals of Power Electronics & Drives” Dhanpat Rai & Sons.

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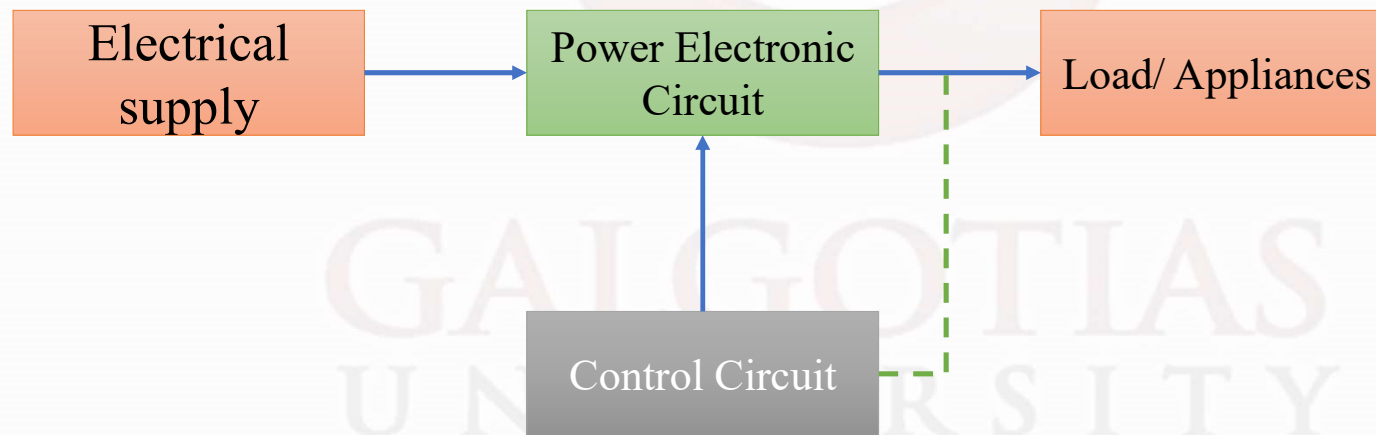
Unit I:	Power semiconductor Devices	08 Hours
Introduction, Characteristics and specifications of switches, Power Diodes, Power Transistors: Operation.Steady state and switching characteristic, Power MOSFETs: Operation and characteristics, Insulated Gate Bipolar transistor: structure, working, latch-up, characteristics, Thyristors: Operation, characteristics, two-transistor model, Turn-on methods, Switching characteristic, Rating and protection, Commutation techniques of thyristor, Series and parallel operation of thyristors, Gate turn off thyristor.		
Unit II:	DC-DC Converters	08 Hours
Principles of step-down chopper, step down chopper with R-L load Principle of step-up chopper, and operation with RL load, classification of choppers, Buck, Boost and Buck-Boost converter.		
Unit III:	Phase Controlled Converters	08 Hours
Single-phase half wave converter with R, RL and RLE loads, Effect of freewheeling diode, Performance parameters, Single-phase full wave converter, midpoint and bridge converter, Effect of source inductance on single-phase converter, Single phase dual converter, Three phase half wave converter with R and RL loads, Three-phase full converter, Performance parameters, Effect of source inductance on three-phase converters, Three-phase dual converter.		
Unit IV:	AC Voltage Controllers	08 Hours
Principle of on-off and phase control, Single-phase two SCRs in anti-parallel with R and RL load, Triac with R and RL load, Three-phase ac voltage controllers, Cycloconverters: Basic principle of operation, Single phase to single phase, three-phase to single-phase cycloconverters, Three phase to three phase cycloconverters		
Unit V:	Inverters	08 Hours
Single phase voltage source inverter, Three-phase bridge inverters, 180-degreeconduction, 120-degree conduction, Voltage control of inverters, Pulse-width modulated inverters, Harmonics reduction techniques, Single phase and three phase current source inverters.		
Unit V:	Applications	08 Hours
Role of Power Converters in Speed control of AC and DC motors, Renewable energy conversion, FACTs Controllers and Grid tied system.		

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## Introduction

- Power electronics circuits is intended to control electrical energy flow in a circuit.



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- ✓ Power electronics converters mainly comprise of solid-state switches, such as **Power MOSFET, Power BJT, IGBT, Thyristors** etc., and lossless components, namely inductors and capacitors.
- ✓ **Inductors and capacitors** are ideally suited for use in power converters as the power loss in these components are minimum as compared to resistances.
- ✓ A power electronic system converts electrical energy from one form to another and ensures the following is achieved –
  - **Maximum efficiency**
  - **Maximum reliability**
  - **Maximum availability**
  - **Minimum cost**
  - **Least weight**
  - **Small size**

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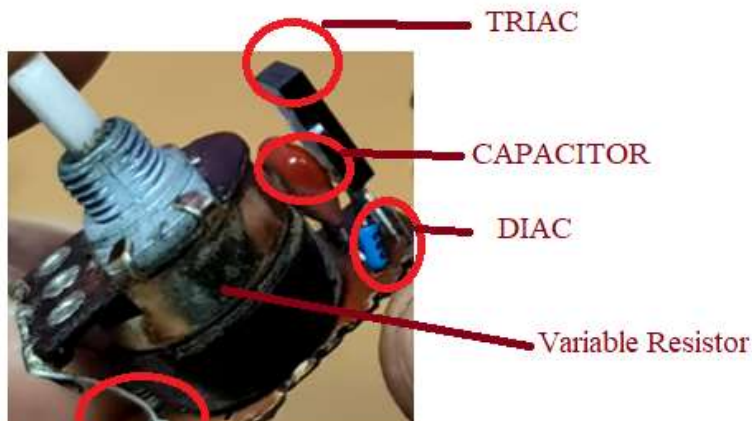
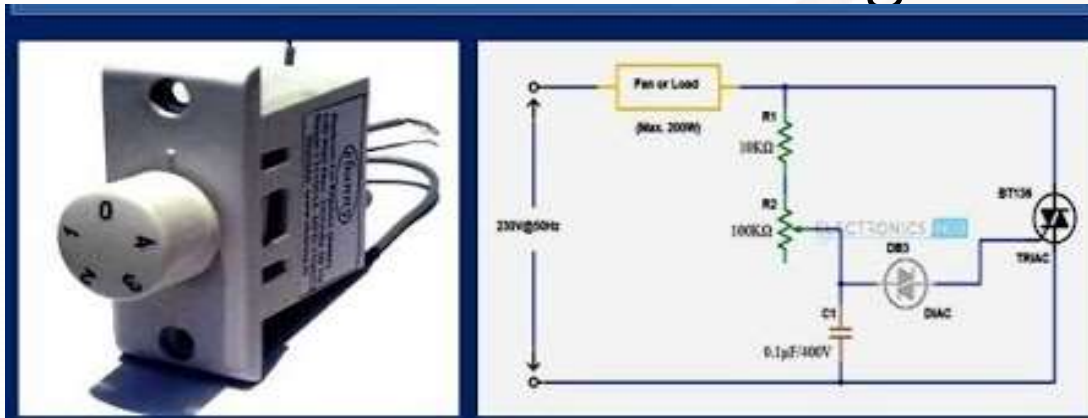
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## Regulator



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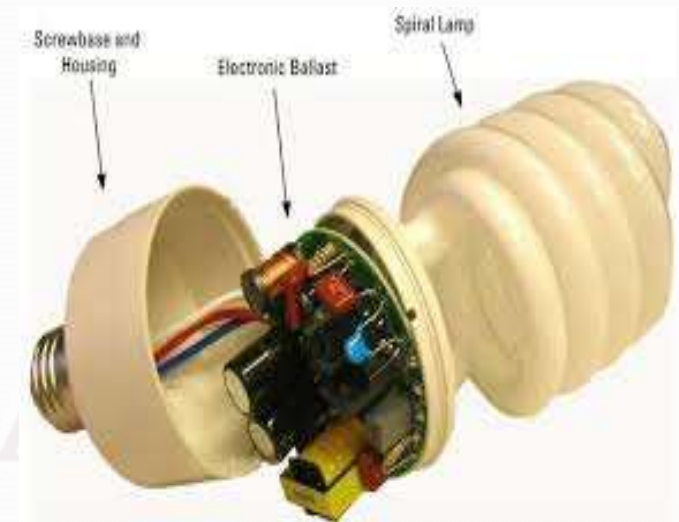
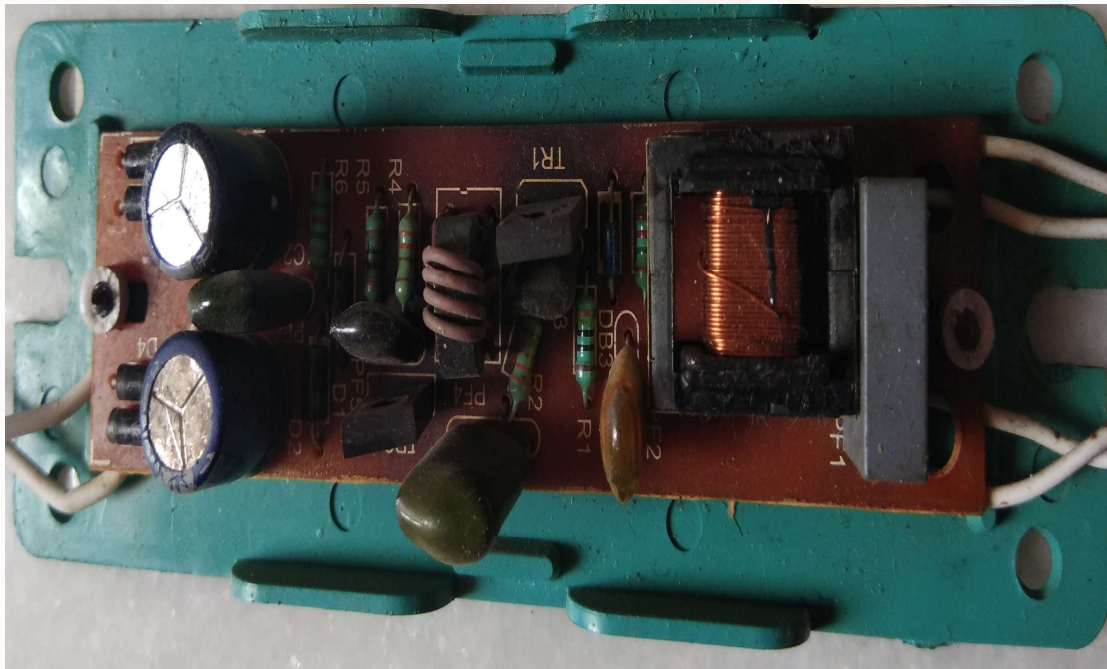


# School of Electrical, Electronics and Communication Engineering

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## Choke



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