

ANALYSIS OF POWER ELECTRONIC CONVERTERS

Hours Per Week :

L	T	P	C
4	1	1	4

Total Hours :

L	T	P

WA/RA	SA	SSH	S	BS

Course Description and Objectives:

This course deals with the basic concepts of converters, choppers, inverters and their analysis. With the advent of semiconductor devices, revolution is taking place in the power transmissions, distribution and utilization.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

- a. Describe the operation of dc-dc, dc-ac, ac-dc and ac-ac power converters.
- b. able to analyze and design switched mode regulator for various industrial applications .
- c. Comprehend the concepts of different power converters and their applications
- d. Evaluate the effects of various modulation techniques on the quality of input and output waveforms.

SKILLS ACQUIRED:

- ✓ Able to understand analysis of basic power electronics converters
- ✓ Able to understand the power quality issues (current and voltage harmonics) caused by the operation of the converters in a power network
- ✓ Able to acquire a skill of understanding principles of static power conversions, PWM techniques for voltage and frequency control, circuit design considerations, and applications of power electronics

ACTIVITIES:

1. Design of DC-DC converter for battery charging application.
2. Design of inverter for UPS.
3. Design of regulator by using AC-AC converter.

UNIT – I**L- 10**

Phase Control Rectifiers : Introduction– Half controlled and Fully controlled converters –harmonic analysis —power factor Improvement -single phase series converters –Numerical problems. Three phase converters – Half controlled and fully controlled converters – harmonic analysis — power factor Improvement – twelve pulse converter– dual converters – Numerical problems.

UNIT – II**L- 10**

Three phase AC voltage controllers and cyclo Converters: Three phase AC voltage controllers – Analysis of controllers with star and delta Connected loads–applications–numerical problems. Three phase to three phase cycloconverters – analysis of Midpoint and bridge configurations – Limitations – Advantages – Applications –numerical problems.

UNIT – III**L- 10**

D.C. to D.C. Converters: Switched mode regulators–analysis of Buck ,Boost , buck-boost and Cuk regulators– comparison- Numerical problems .DC-DC converters with isolation- fly back, forward, push pull and half bridge configurations- comparison – applications –Numerical problems.

UNIT – IV**L- 10**

Pulse Width Modulated Inverters(Three Phase): Three phase inverters – analysis of 180 degree 120 degree Conduction modes – voltage control of three phase inverters – sinusoidal PWM – Third Harmonic PWM – 60 degree PWM – space vector modulation – Comparison of PWM techniques –Current Source Inverter –

UNIT – V**L- 10**

Resonant Converters: Resonant Converters- Zero current switching (ZCS) DC-DC converter -zero voltage switching(ZVS) DC-DC converter- clamped voltage (ZVSCV)- applications –Numerical problems

TEXT BOOKS:

1. R. Erickson and D. Maksimovic, “Fundamentals of Power Electronics,” 2nd Edition 2001, Springer International Edition.
2. Ned Mohan, Tore M, Undelnad, William P, Robbins (3 Edition), “ Power Electronics: Converters, Applications and Design,” Wiley 2002.

REFERENCES:

1. Mohammed H. Rashid, "Power Electronics", 3rd ed., Pearson Education, First Indian reprint 2004.
2. Ned Mohan, Tore M. Undeland and William P.Robbins, "Power Electronics" 2nd ed., John Wiley & Sons.