

ANALYSIS OF POWER ELECTRONIC CONVERTERS-I

Course Code: 15EE2201

L P C
3 0 3

Pre requisites: Power Electronics

Course Outcomes: At the end of the course, the students will be able to

CO1: Distinguish between different types of power semiconductor devices and their characteristics

CO2: Analyze Phase controlled converters, AC voltage controllers and Cycloconverters.

CO3: Analyze DC – DC switch mode converters.

CO4: Analyze DC-AC switch mode inverters.

CO5: Describe the Principle of SPWM & SVPWM

UNIT-I

(10-Lectures)

POWER SEMICONDUCTOR DEVICES

Power Diodes, Power BJTs, Power MOSFETs, Thyristors, Gate Turn Off Thyristors, IGBTs, MOS-Controlled Thyristors, Comparison of Controllable Switches, Drive and Snubber Circuits, Justification for Using Idealized Device Characteristics.

UNIT-II

(10-Lectures)

CONTROLLED RECTIFIERS, VOLTAGE CONTROLLERS AND CYCLOCONVERTERS

Introduction, Principle of phase controlled converter operation, single phase full converters, single phase dual converters, Three phase half wave converters, three phase full converters, Three phase dual converters, Power factor improvements, Single phase semi converters, Three phase semi converters.

Introduction, Principle of ON-OFF Control, Single phase bidirectional controllers with resistive loads, Single phase controllers with inductive loads, Three Phase full wave controllers, Single phase transformer

connection changers, Single phase cycloconverters, Three phase cycloconverters.

UNIT-III (10-Lectures)

DC-DC SWITCH MODE CONVERTERS

Introduction, Control of dc-dc converters, Step down (Buck) converter-continuous conduction mode-boundary between continuous and discontinuous conduction-discontinuous conduction mode. Step up (Boost) converter- continuous conduction mode-boundary between continuous and discontinuous conduction-discontinuous conduction mode.

Buck-Boost converter- continuous conduction mode-boundary between continuous and discontinuous conduction-discontinuous conduction mode-output voltage ripple.

UNIT –IV (10-Lectures)

SWITCH MODE INVERTERS

Introduction, Basic concepts of switch mode inverters, pulse width modulated switching scheme, single phase inverters-half bridge inverters-full bridge inverters-PWM with bipolar voltage switching-PWM with unipolar voltage switching, Push-pull inverters, Three phase inverters-PWM in three phase voltage source inverters-square wave operation in three phase inverters, Ripple in the Inverter output, effect of blanking time on voltage in PWM inverters.

UNIT-V (10-Lectures)

SPACE VECTOR PWM

Principle of PWM, Principle of space vector PWM, converter switching states, linear or under modulation region, over modulation region, implementation steps.

TEXT BOOKS:

1. Ned Mohan, Tore M. Undeland and William P. Robbins, “Power Electronics”, John Wiley & Sons, 2007.

2. Md. H. Rashid, “Power Electronics”, Pearson Education, Third Edition, 2008
3. Bimal K. Bose, “Modern Power Electronics and AC Drives”, Prentice-hall Of India Pvt. Ltd., 2008.

REFERENCE BOOKS:

1. Philip T. Krein, “Elements of Power Electronics”, Oxford University Press, 2009.
2. L. Umanand, “Power Electronics: Essentials & Applications”, Wiley India, 2009.
3. Robert Erickson and Dragomir Maksimovic, “Fundamentals of Power Electronics”, Springer Publications, 2001.
4. Issa Batarseh, “Power Electronics”, John Wiley, 2003.