18PEE23	DYNAMICS OF POWER CONVERTERS	L	T	P	C
		3	0	0	3

Course Objectives:

1.	To provide knowledge in dynamic behavior and analyses of the DC-DC converters and three phase grid connected converters with source and load interactions.

Unit I	INTRODUCTION TO DYNAMIC ANALYSIS	9	+	0

Introduction- Generalized Dynamic Representations for Voltage fed and Current fed DC-DC converters- Source and Load Interactions- Generalized Dynamic Representations for three-phase voltage-fed and current fed rectifiers, Three-phase voltage fed and current-fed inverters-closed loop dynamics- Generalized Cascaded Control Schemes - Generalized Impedance-Based Stability

Unit II	DYNAMIC MODELING AND CONTROL OF VOLTAGE FED DC-DC CONVERTERS	9	+	0

Direct-on-Time Control- DOT-controlled converter at open loop with a PWM modulator; Generalized Modeling Technique; Dynamic model of Buck-converter -power stages- topological sub circuit structures- state space equations- Linearized state space model; Peak Current Mode Control principles- Development of Duty-Ratio Constraints- PCM State Spaces and Transfer Functions

Unit III	DYNAMIC MODELING AND CONTROL OF CURRENT FED DC-DC CONVERTERS	9	+	0

Duality Transformation Basics- Duality-Transformed Converters- Voltage-fed and Current-fed buck, boost converters; Dynamic equivalent circuits of current fed current-output converter and current-fed voltage output converter; Dynamic model of current fed Buck , Boost Converters; Duty-Ratio Constraints under PCM Control- PCM-controlled current-fed buck, boost power-stage converter

Unit IV	DYNAMICS OF THREE PHASE INVERTERS	9	+	0

Dynamic Model of Voltage-Fed Inverter- Equivalent switching circuit and average model - Linearized State-Space and Open-Loop Dynamics; Dynamic Model of Current-Fed Inverter- Equivalent switching circuit and average model- Linearized Model and Open-Loop Dynamics Control Design of Grid-Connected Three-Phase Inverters- Synchronous Reference Frame Phase Locked Loop- Linearized Model of SRF-PLL- Control Design of SRF-PLL

Unit V	DYNAMIC MODELING OF THREE PHASE ACTIVE RECTIFIERS AND STABILITY ASSESSMENT	9	+	0

Three Phase active rectifier -Power stage and Equivalent switch matrix- Equivalent circuit model- State space model- Control of active rectifier using transfer matrices- Open-Loop and closed loop control scheme

Total (L+T)= 45 Periods

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1	:	*Know the dynamic representations of power converters*
CO2	:	*Make a dynamic model of DC-DC converter*
CO3	:	*Select appropriate control scheme for DC-DC converter with its dynamic model*
CO4	:	*Develop state space model for three phase converters*
CO5	:	*Design a suitable controller for for three phase converters*

Reference Books:

1.	Teuvo Suntio, "Power Electronic Converters:Dynamics and Control in Conventional and Renewable Energy Applications", Wiley-VCH Verlag GmbH & Co. KGaA, Germany, 2018.
2.	*Teuvo Suntio,* Dynamic Profile of Switched-Mode Converter Modeling, Analysis and Control, Wiley-VCH Verlag GmbH & Co. KGaA, Germany, 2009.

PO / CO	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
CO1	*Know the dynamic representations of power converters*	2		3			1	1				
CO2	*Make a dynamic model of DC-DC converter*	1			2				2			2
CO3	*Select appropriate control scheme for DC-DC converter with its dynamic model*		2			3			1			2
CO4	*Develop state space model for three phase converters*			1		1						
CO5	*Design a suitable controller for three phase converters*	1			2						1	