22EEHO204	MODELING AND CONTROL OF POWER CONVERTERS	SEMESTER			
PREREQUISITES	CATEGORY	PEC	Credit		3
Power Electronics and Control Systems	Hours/Week	L	T	P	TH
		3	0	0	3

Course Objectives:

1. To learn the basics of control system simulation.
2. To do symbolic calculation and study the principles of sliding mode control and the way of apply smc for buck converter.
3. To learn the concept of power factor correction.
4. To design simulate smc for buck converter and power factor correction circuit with controller.

UNIT I	SIMULATION BASICS IN CONTROL SYSTEMS	9	0	0	9

Transfer Function-How to build transfer function, identify Poles, zeros, draw time response plots, bode plot (Bode Plots for Multiplication Factors, Constant, Single and Double Integration Functions, Single and Double Differentiation Functions, Single Pole and Single Zero Functions, RHP Pole and RHP Zero Functions), state space modelling-transfer function from state space model.

UNIT II	SYMBOLIC CALCULATIONS	9	0	0	9

Symbolic Variables - Symbolic Vector Variables, Commands for Handling Polynomial Expressions - Extracting Parts of a Polynomial -. Factorization and Roots of Polynomials, Symbolic Matrix Algebra - Operations with Symbolic Matrices - Other Symbolic Matrix Operations.

UNIT III	SLIDING MODE CONTROL BASICS	9	0	0	9

Introduction- Introduction to Sliding-Mode Control- Basics of Sliding-Mode Theory- Application of Sliding-Mode Control to DC-DC Converters—Principle-Sliding mode control of buck converter.

UNIT IV	POWER FACTOR CORRECTION CIRCUITS	9	0	0	9

Introduction, Operating Principle of Single-Phase PFCs, Control of boost converter based PFCs, Designing the Inner Average-Current-Control Loop, Designing the Outer Voltage-Control Loop, Example of Single-Phase PFC Systems.

UNIT V	CONTROLLER DESIGN FOR PFC CIRCUITS	9	0	0	9

Power factor correction circuit using other SMPS topologies: Cuk and SEPIC converter - PFC circuits employing bridgeless topologies.

Total (45L+0T) = 45 Periods

Text Books:

1. Feedback Control problems using MATLAB and the Control system tool box By Dean Frederick and Joe Chow, 2000, 1st Edition, Cengage Learning.
2. Ned Mohan,"Power Electronics: A First Course", Johnwiley, 2013, 1st Edition.
3. Marian K. Kazimierczuk and AgasthyaAyachit,"Laboratory Manual for Pulse-Width Modulated DC-DC Power Converters", Wiley 2016, 1st Edition.
4. Power Electronics handbook, Industrial Electronics series, S.K.Varenina, CRC press, 2002, 1st Edition.

Reference Books:

1. Sliding mode control for Switching Power Converters:, Techniques and Implementation, Slew-Chong Tan, Yuk Ming Lai Chi-Kong Tse, 1st Edition, CRC Press.
2. Andre Kislovski, "Dynamic Analysis of Switching-Mode DC/DC Converters", Springer 1991.
3. MATLAB Symbolic Algebra and Calculus Tools, Lopez Cesar, Apress, 2014.

Course Outcomes: Upon completion of this course, the students will be able to:			**Bloom's Taxonomy Mapped**
CO1	:	To calculate transfer function for constant, differential, integral, First order and Second order factors.	L2: Understanding
CO2	:	To illustrate the effect of poles and zero's in the 's' plane.	L1: Remembering
CO3	:	To select Symbolic equations for solving problems related with Matrices, Polynomial and vectors.	L5: Evaluating
CO4	:	To compute the control expression for DC – DC buck converter using sliding mode control theory	L3: Applying

CO5	:	To determine the controller expression for power factor correction circuits and to simulate sliding mode control of buck converter and power factor correction circuit.	L5: Evaluating

COURSE ARTICULATION MATRIX

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	3	3	3			1		2		3	3	3	3
CO2	3	3	3	3	3			1		2		3	3	3	3
CO3	3	3	3	3	3			1		2		3	3	3	3
CO4	3	3	3	3	3			1		2		3	3	3	3
CO5	3	3	3	3	3			1		2		3	3	3	3
Avg	3	3	3	3	3	0	0	1	0	2	0	3	3	3	3

3/2/1-indicates strength of correlation (3- High, 2-Medium, 1- Low)