

SWITCHED MODE POWER CONVERSION

Course Code	23EE4702B	Year	IV	Semester(s)	I
Course Category	Professional Elective-V	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Power electronics, Control Systems.
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Understand the principles, design concepts, and operational characteristics of non-isolated and isolated switch mode converters used in power electronic systems. (L2)
CO2	Apply the operation and performance of non-isolated and isolated switch mode converters used for electrical isolation and voltage transformation in power supplies. (L3)
CO3	Illustrate the working principles and applications of resonant converters for efficient high-frequency power conversion. (L3)
CO4	Analyze and design control schemes for power electronic converters, including the design of transformers and inductors used in converter circuits. (L4)
CO5	Analyze Modelling of power electronic converters and design appropriate controllers for achieving stable closed-loop operation and improved system performance. (L3)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3									2		
CO2	3	2	1			1					2	2	1
CO3	2	2	1								2	2	1
CO4	3	3	2			1					2	2	1
CO5	3	3	2			1					2	2	1

SYLLABUS		
Unit No.	Contents	Mapped CO
I	Non-Isolated Switch Mode Converters Control of DC-DC converters: Buck converters - Boost converters - Buck-Boost converter - CUK Converter - continuous and discontinuous operation - Converter realization with non-ideal components.	CO1 CO2

II	Isolated Switched Mode Converters Forwarded converter - flyback converter - push-pull converter - half-bridge converter - full bridge converter.	CO1 CO2
III	Resonant Converters Basic resonant circuit concepts - series resonant circuits - parallel resonant circuits - zero current switching quasi-resonant buck converter - zero current switching quasi-resonant boost converter - zero voltage switching quasi-resonant buck converter - zero voltage switching quasi-resonant boost converter.	CO1 CO3
IV	Control Schemes of Converters and Magnetic Design Voltage mode control - Current mode control - Current control mode instability. Magnetic Design: Transformer design - inductor and capacitor design	CO1 CO2 CO4
V	Modelling of Converters and Controller Design Based on Linearization: Formulation of large signal models for buck and boost converters using state space analysis-derivation of averaged large signal model using circuit averaging method-small signal model derivation- average switch modelling technique to obtain small signal models of buck and boost converters- Transfer function of converters-Controller design based on linearization.	CO1 CO5

Learning Resources	
Text Books	
1. Fundamentals of Power Electronics- Erickson - Robert W. - Maksimovic - Dragan - Springer - 2011. 2. Power switching converters- Simon Ang - Alejandro Oliva - CRC Press - 2010. 3. Power Electronics: Essentials & Applications- L. Umanand, S.P. Bhat, John Wiley & Sons Australia, 1992 .	
Reference Books	
1. Switching Power Supply Design- Abraham I. Pressman - McGraw-Hill Ryerson - Limited - 1991. 2. Power Electronics: converters Applications & Design – Mohan - Undeland - Robbins-Wiley publications. 3. Design of Magnetic Components for Switched Mode Power Converters- Z Umanand - S.P. Bhat - John Wiley & Sons Australia - 1992. 4. Elements of Power Electronics – Philip T. Krein - Oxford University press - 2014.	
E-Resources	
1. https://nptel.ac.in/courses/108108036 2. https://nptel.ac.in/courses/108105180	