COURSE TITLE	**SWITCH MODE POWER SUPPLIES**
COURSE CODE	**01EE1607**
COURSE CREDITS	**3**

Objective:

1 To study and analyse various types of switched mode dc- dc converters, inverters and resonant converters and its switching techniques

Course Outcomes: After completion of this course, student will be able to:

1 Describe various switch mode power supply technologies and its characteristics.

2 Compare the operation of various converter topologies used in switch mode power supply.

3 Discuss the selection criteria for various components of SMPS.

4 Analyze the performance of switched mode power supply and interpret the basics of mathematical modelling of it.

5 Describe various operating modes and control techniques applied to SMPS

Pre-requisite of course: Basic Electronics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Introduction to Non-isolated and Isolated dc-dc converter** Buck Converter, Boost Converter, Buck-Boost Converter, Cuk Converter, SEPIC converters, Continuous conduction mode and discontinuous conduction mode analysis, Non-idealities in the SMPS, Flyback Converter, Forward Converter, Push-Pull Converter, Half bridge Converter , Full bridge Converter topologies	10
2	**Resonant Converters** Basic resonant circuit concepts, ZCS resonant converter, ZVS resonant converter, comparison of ZCS & ZVS Resonant Converters	4
3	**Synchronous Rectification** Selection Criteria for Schottky Diode and MOSFET, Synchronous Rectification with Basic Switching Power Supply Topologies, Buck Converter with Synchronous Rectification, Synchronous Boost Converter, Synchronous Buck-Boost Converter, Control of Synchronous Rectifier, Current-Mode Control Methods, Discrete and Integrated Approach for Synchronous Rectification	10

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Contents : Unit	Topics	Contact Hours
4	**Design of SMPS components** Design of Inductor, Design of Transformer, Capacitors for Power Electronic Application, Types of Capacitors	6
5	**Modelling of SMPS** Duty cycle and current model control, canonical model of the converter, Averaged Model of the Converter, Generalized State Space Model of the Converter, Dynamic Model of Converters Operating in DCM	6
6	**Control of SMPS** Closed Loop Control, Closed Loop Performance Functions, Effect of Input Filter on the Converter Performance, Design Criteria for Selection of Input Filter	6
Total Hours		**42**

Textbook :

1 Power Electronics Essentials and Applications, L. Umanand, Wiley India Ltd., 2009

2 Power Electronics – Converters, Applications and Design, Ned Mohan, Tore M. Undeland and William P. Robbins,, John Willey & sons, Inc., 3rd ed, 2003

3 Switching power supplies A to Z, Sanjaya Maniktala, Elsevier Inc., 2006

4 DC-DC Switching Regulator Analysis, Daniel M Mitchell, McGraw Hill, 1988

References:

1 Integrated Power Electronic Converters and Digital Control, Integrated Power Electronic Converters and Digital Control, Ali Emadi, Alireza Khaligh, Zhong Nie, Young Joo Lee, CRC Press, 2009

2 Switched Mode Power Conversion,, Switched Mode Power Conversion,, V. Ramanarayanan, Indian Institute of Science Bangalore, 2007

3 Switching Power Supply Design, Switching Power Supply Design, Abraham Pressman, McGraw-Hill Professional, 2009

4 Switch mode power supply handbook – 1st edition, Switch mode power supply handbook – 1st edition, Keith H Billings, McGraw-Hill Education, 1998

5 Switched-Mode Power Supplies in Practice, Switched-Mode Power Supplies in Practice, Otmar Kilgenstein, John Wiley and Sons., 1991

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
20.00	30.00	25.00	15.00	10.00	0.00

Supplementary Resources:

1 https://nptel.ac.in/courses/117/106/117106086/

2 https://www.coursera.org/learn/electronics

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