GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Instrumentation and Control Engineering

(Applied Instrumentation)

Subject Name: SWITCH MODE POWER SUPPLY

Sr.No	Course content
1.	The switching power supply: an overview
2.	Input section - The voltage doubler technique, component selection and design criteria, input rectifiers, input filter capacitor, input protective devices, inrush current, input transient voltage protection
3.	Types of power converter - Definition, Isolated and un isolated version of various converter topologies viz. Buck, boost, Buck-boost, half-bridge, full bridge ,cuk converter, push pull .
4.	Power transistors in converter design - Introduction, transistor selection, the bipolar power transistor used as switch, switch times definitions of bipolar transistor (resistive load), inductive load switching relationship, transistor anti-saturation circuit, base drive circuit techniques for bipolar transistor, bipolar transistor secondary breakdown consideration, switching transistor protective network, the power MOSFET used as switch, gate drive consideration of the MOSFET, static operating characteristic of the MOSFET, MOSFET safe operating area, Design consideration for driving the power MOSFET, circuits used in driving the MOSFET, power MOSFET switch protection circuits, the gate turn-off (GTO) switch.
5.	High frequency power transformer - Principle of electromagnetism, the hysteresis loop, basic transformer theory, core material and geometry section, design of power transformer and choke for converters, practical considerations, some general high frequency transformer consideration
6.	Output section - Introduction, output rectification and filtering schemes, power rectifier characteristics in switching power supply design, synchronous rectifier, output power inductor design, magnetic amplifiers, design the output filter capacitor
7.	Switching regulator control circuit - Isolation techniques of switching regulator systems, PWM systems, integrated circuit for PWM control
8.	Switching power supply ancillary, supervisory, and peripheral circuits and components: The optical coupler, a self biased techniques used in primary side-reference power supplies, optocoupler circuit design to provide input-to-output isolation in switching power supply, soft start in switching power supply, current limit circuits, overvoltage protection circuits, AC line loss detectors

9.	Stability in switching power supplies - Transfer function, Off-the-line switching power supply stability analysis, stability analysis and synthesis using K factor, loop stability measurement

Reference Books:

1. Joseph Vithayathil, Power Electronics, McGraw Hill
2. Pasadena, Mohan N., Power Electronics: Principles, Analysis and Design, John Wiely
3. Umanand and Bhat, Design of magnetic components of SMPS willey-eastern