GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VIII

POWER ELECTRONICS ENGINEERING

Subject Name: **DIGITAL CONTROL OF POWER PROCESSING CIRCUITS**

Sr. No.	Course Contents	Total Hrs
1.	Introduction: • Review of modern power electronics – Importance of digital control – Trends and perspective	**8**
2.	Single Phase VSI & PWM • Fundamental components – Required additional electronics: driving and sensing – Principle of operation – Dead times – Low level control of the voltage source inverter • PWM modulation – Analog PWM: the naturally sampled implementation – Digital PWM: the uniformly sampled implementation – Single update and double update PWM model – Minimization of modulator delay – Motivation for multisampling – Analog control approaches – Linear current control: pi solution – Non-linear current control: hysteresis control	**12**
3.	Digital Current Mode Control • Requirements of the digital controller – Signal conditioning and sampling – Synchronization between sampling and PWM – Quantization noise and arithmetic noise – Basic digital current control implementations Proportional Integral Controller • Overview – Simplified dynamic model of delays – The proportional integral controller: discretization strategies – Effects of the computation delay – Derivation of a discrete time domain converter dynamic model – Minimization of the computation delay – The predictive controller	**12**
4.	Phase Inverter • The $\alpha\beta$ transformation – Space Vector Modulation - Vector modulation based controllers – The rotating reference frame current controller – Park's transformation – The rotating reference frame pi current controller – A different implementation of the rotating reference frame pi current controller	**10**
5.	External Loop Control • Modeling the internal current loop – Design of voltage controllers – Possible strategies: large and narrow bandwidth controllers – The DFT filter based voltage controller – Other applications of the current controlled VSI – The controlled rectifier – The active power filter	**8**

Text Book:

1. Simone Buso, "Digital Control in Power Electronics"

Reference Book:

1. Ned Mohan, Undeland & Robbins,"Power Electronics: Converters, Applications and Design"