GUJARAT TECHNOLOGICAL UNIVERSITY
POWER ELECTRONICS ENGINEERING
B. E. SEMESTER: VII

Subject Name: **Industrial Drives and Control – II**
Subject Code: **172402**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
4	0	2	6	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	**Introduction to Induction Motor Drives:** • Analysis and performance of 3-Øinduction motor • Operation of induction motor on unbalanced source voltage & single phasing, comparison of IM operation with balanced source voltage and unbalanced source voltage. • Operation with unbalanced rotor impendence • Analysis of Induction Motor with Non Sinusoidal source Voltages • Starting, Braking and Transient analysis of drives.	06
2.	**Induction Motor drives** • Types of Induction Motor Control • Stator voltage control of induction motor: Torque slip characteristics, operation with different types of loads, closed loop control of Stator voltage through power electronics modulator • Stator frequency control: variable frequency operation, V/F control, controlled current and controlled slip operation, Effect of harmonics and control of harmonics, PWM inverter drives, Multiquadrant drives, closed loop control of stator frequency through Power Electronics Modulator • Rotor resistance control: slip - torque characteristics, rotor choppers, torque equations, constant torque operation, closed loop control of Rotor Resistance through Power Electronic Modulator • Slip power recovery scheme: torque equation, torque slip characteristics, power factor, methods of improving power factor, limited sub synchronous speed operation, super synchronous speed operation, closed loop control of slip power recovery scheme.	12
3.	**Synchronous motor drives** • Speed control of synchronous motors, adjustable frequency operation of synchronous motors, principles of synchronous motor control , Voltage	10

	Source Inverter Drive with open loop control , self controlled synchronous motor with electronic commutation , self controlled synchronous motor drive using load commutated thyristor inverter. Principle of Vector control.	
4.	**Modeling of Induction Machine** • Dynamic d-q modeling of induction machines, stator, rotor and synchronously rotating reference frame models, state space equations and dynamic simulation, Space Phasor model, control principle of the induction motor	08
5.	**Vector Control of Induction Motor Drive** • Basic principle, Direct Rotor flux oriented vector control , Estimation of rotor flux and torque , Implementation with current source and voltage source inverters Stator flux oriented vector control , Indirect rotor flux oriented vector control scheme implementation, tuning, Dynamic simulation. • Parameter sensitivity and compensation of vector controlled induction motors, Selection of Flux level, Flux weakening operation, Speed controller design, Vector control strategies for Synchronous motor.	10
6.	**Sensor less Control of induction motor drives** • Principles for speed sensor less control**,** Sensor less methods for scalar control, Sensor less methods for vector control, Introduction to observer based techniques, Basic principle of DTFC.	04
7.	**Special Machine Drives:** • SRM operation and control, Converter circuits, modes of operations • Permanent Magnet AC Motor drives, Sinusoidal PMAC motor drives, Trapezoidal PMAC motor drives.	04

Text Books:

1. Modern Power Electronics and AC Drives, B K Bose.
2. Power Semiconductor Controlled Drives. G. K. Dubey.

Reference Books:

1. Electrical Motor Drives, R. Krishnan.
2. Fundamentals of Electrical Drives, G K Dubey.
3. Electrical Drives, 2nd ed. S.A. Nasar, Boldea.
4. Fundamentals of Electrical Drives M. A. El-Sharkawi.
5. Practical Variable Speed Drives and Power Electronics, Malcolm Barness