GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Semester: III

Electrical Engineering

Subject Name **ADVANCED ELECTRICAL DRIVES (POWER ELECTRONICS GROUP)**

Sr.No	Course content
1.	Review of dc drives and scalar control of AC drives; Disadvantages of scalar control of AC drives
2.	**Reference frame theory & Modeling of Induction Motor** Space vector theory, 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
3.	**Vector Control** Vector controlled 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 – Direct torque control of Induction Motor, Vector control strategies for Synchronous motor.
4.	**Sensor less Control** Principles for speed sensor less control **-** Sensor less methods for scalar control, Sensor less methods for vector control, Introduction to observer based techniques.
5.	**Special Machines** Brushless DC drives-principle, performance and inverter control strategies, PMSM motor & synchronous reluctance motor: converter and driver configurations, control scheme and performance characteristics, Linear induction motor, Hysterisis motor, Stepper motor- principle, construction, operation and drive application, Energy conservation in Electrical drives.

Activities:

1. Developing a dynamic model of an Induction motor and simulating it in SIMULINK.
2. Simulating a closed loop control of an induction motor employing any of the vector control methods studied in the subject/course.
3. Literature survey of the commercially available vector controlled AC drives.

Reference Books:

1. Modern Power Electronics and AC Drives, Pearson Education, 2002- B.K. Bose
2. 'Electric Motor Drives: Modeling, Analysis and Control,' Prentice-Hall India, New Delhi, 2003- R. Krishnan
3. "Sensor less vector and direct torque control", Oxford Press- P. Vas
4. Brushless Permanent-magnet and reluctance motor Drives - T.J.E. Miller
5. Control of electrical drives, Springer-2001- Werner Leonhard
6. Vector Control and Dynamics of AC Drives, Oxford University Press, 1996- D W Novotny and T A Lipo
7. Control in Power Electronics-Selected Problems, Academic Press, 2002- Kazmierkowski, Krishnan, Blaabjerg