

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BRANCH NAME: ELECTRICAL ENGINEERING**  
**SUBJECT NAME: ELECTRICAL DRIVES**  
**SUBJECT CODE: 3710709**  
**M.E. 1<sup>st</sup>SEMESTER**

**Type of course: Program Elective-2**

**Prerequisite: -**

**Rationale:**

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE(E)	PA (M)	PA (V)	PA (I)		
3	0	2	4	70	30	30	20	150

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
1	<b>Dynamics of Electric Drives:</b> Fundamentals of torque equation, Speed torque convention and Multi-quadrant operation, components of load torques, Classification of load torques steady state stability, Load equation, Speed control and drive classification, Close loop control of drives.	6	9
2	<b>DC motor Drives:</b> Modelling of DC machines, Steady state characteristics with armature and speed control, Phase controlled DC motor drives, chopper controlled DC motor drives.	8	21
3	<b>Poly-phase induction machines:</b> Dynamic modelling of induction machines, Small signal equations, control characteristics of induction machines, Phase-controlled induction machines, Stator voltage control, Slip energy recovery scheme, frequency control and vector control of induction motor drives.	12	28
4	<b>Traction motor:</b> Starting, Speed-Time characteristics, Braking, Traction motors used in practice.	8	21
5	<b>Industrial Drives:</b> Digital Control of Electric Drives, BLDC motor drives, Stepper motor, Servo motor and their Applications.	8	21

**Reference Books:**

1. G.K. Dubey, "Power semiconductor controlled Drives", Prentice Hall international, New Jersey, 1989.
2. R.Krishnam, "Electric motor drives modeling, analysis and control", PHI-India-2009.
3. G. K. Dubey, "Fundamentals of electric Drives, Narosa Publishing House", 2<sup>nd</sup> edition, 2011.
4. W. Leonhard, "Control of Electrical drives", Springer, 3<sup>rd</sup> edition, 2001.
5. P.C. Krause, "Analysis of Electric Machine", Wiley-IEEE press 3<sup>rd</sup> edition.
6. B. K. Bose, "Modern Power Electronics and AC Drives", Prentice Hall publication, 1<sup>st</sup> edition, 2001.

**Course Outcome:**

After learning the course the students should be able to:

1. Model and simulate electric drive systems
2. Design modulation strategies of power electronics converters, for drives application
3. Design modulation strategies of power electronics converters, for drives application
4. Select and implement the drives for Industrial Process
5. Select and implement the drives for Industrial Process

**List of Experiments:**

1. Study of Thyristor controlled D.C Drive.
2. Study of Chopper Fed DC Motor.
3. Study of A.C single phase motor speed control using TRIAC.
4. PWM inverter fed three phase induction motor control using PSPICE/MATLAB/PSIM software.
5. VSI/CSI fed induction motor drive analysis using MATLAB/PSPICE/PSIM software.
6. Study of V/f control operation of three phase induction motor.
7. Study of permanent magnet synchronous motor drive fed by PWM inverter using software.
8. Regenerative/ Dynamic breaking operation for DC motor study using software.
9. Regenerative/ Dynamic breaking operation for AC motor study using software.
10. PC/PLC based AC/DC motor control operation.

**Major Equipment:**

**As per experiment**

**List of Open Source Software/learning website:**

<http://nptel.ac.in>