

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MANUFACTURING ENGINEERING

### ELECTRICAL DRIVES AND CONTROLS

**SUBJECT CODE:** 2133402

B.E. 3<sup>RD</sup> SEMESTER

**Type of course:** Theoretical + Practical (Regular)

**Prerequisite:** Basic knowledge of elements of electrical engineering

**Rationale:** Correlate the characteristic of Drives, Construction and Workings

#### 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)		
				PA	ALA	ESE	OEP			
3	0	2	5	70	20	10	20	10	20	150

#### Contents:

Sr. No.	Subject Content	Hours	Module Weightage
1.	<b>Introduction:</b> Basic elements – Types of electric drives – Factors influencing the choice of electrical drives – Heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and load variation factors	<b>6</b>	<b>20</b>
2.	<b>Motor Characteristics:</b> Mechanical characteristics – Speed –Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors – Shunt – Series – Compound – Single phase and three phase induction motors	<b>12</b>	<b>20</b>
3.	<b>Starting Methods:</b> Types of D.C motor starters – Typical control circuits for shunt and series motors –Three phase squirrel cage and slip ring induction motors	<b>8</b>	<b>20</b>
4.	<b>Conventional And Solid State Speed Control Of D.C. Drives:</b> Speed control of DC series and shunt motors – Armature and field control –Ward-Leonard control system – Using controlled rectifiers and DC choppers – Applications	<b>8</b>	<b>20</b>
5.	<b>Conventional And Solid State Speed Control Of A.C. Drives:</b> Speed control of three phase induction motor – Voltage control – Voltage / frequency control – Slip power recovery scheme – Using inverters and AC voltage regulators – Applications	<b>8</b>	<b>20</b>

#### Reference Books:

1. Pillai.S.K “A First Course on Electric Drives”, Wiley Eastern Limited, 1998.
2. Singh, M.D., and Khanchandani, K.B., “Power Electronics”, Tata McGraw-Hill, 1998.

3. Partab, H., “Art and Science and Utilisation of Electrical Energy”, Dhanpat Rai and Sons, 1994.

**Course Outcome:**

After learning the course the students will have knowledge about motor characteristics, starting methods, Conventional and Solid State Speed Control of D.C. Drives and Conventional and Solid State Speed Control of A.C. Drives

**List of Experiments:**

1. Study of DC machine parts and their identification.
2. Perform Load test on DC shunt generator and obtain Internal & External characteristics.
3. To obtain External & Internal Characteristics of DC series generator.
4. To perform speed controls of DC shunt motor by (A) Field control method, (B) Armature Control Method.
5. Load Test on DC shunt motor with mechanical load.
6. Load test on DC series motor with mechanical load.
7. Speed control of 3 Phase Slip Ring Induction motor by Rotor resistance control method.
8. To study about different types of DC motor Starter.
9. To Study about different types of AC motor Starter.

**Design based Problems (DP)/Open Ended Problem:**

1. Seminar on the recent advancements in AC speed control drives using electronic components by the students.

**Major Equipments:**

DC Motors, AC Motors, 3 Phase Variac, 1 Phase Variac, Servo Control Rectifier Panel, AC distribution Panel, Transformer, Starter, Multimeters.

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

1. <http://www.electrical4u.com/electrical-drives/>
2. <http://nptel.ac.in/courses/108104011/>

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.