



# **C.U.SHAH UNIVERSITY – WADHWAN CITY**

**FACULTY OF- -Technology and Engineering (Diploma Engineering)**

**DEPARTMENT OF- -Electrical Engineering**

**SEMESTER-V**

**CODE- 2TE05EDA1**

**NAME –Electrical Drives and Applications (EDA)**

## **Teaching & Evaluation Scheme--**

| Subject Code | Subject Name                       | Teaching Scheme (Hours) |    |    |       | Credits | Evalution Scheme |       |                 |       |                   |    |            |     |             |
|--------------|------------------------------------|-------------------------|----|----|-------|---------|------------------|-------|-----------------|-------|-------------------|----|------------|-----|-------------|
|              |                                    | Th                      | Tu | Pr | Total |         | Theory           |       |                 |       | Practical (Marks) |    |            |     | Total Marks |
|              |                                    |                         |    |    |       |         | Sessional Exam   |       | University Exam |       | Internal          |    | University |     |             |
|              |                                    |                         |    |    |       |         | Marks            | Hours | Marks           | Hours | Pr                | TW | Pr         | TW  |             |
| 2TE05EDA1    | Electrical Drives and Applications | 04                      | 00 | 02 | 06    | 05      | 30               | 1.5   | 70              | 03    | ---               | 20 | 30         | --- | 150         |

## **Objectives--**

- To Develop Basic Concepts and Knowledge of Drives.
- To Know about Different Types of Drives Controlling by Conventional Method.
- To Know about Different Types of Drives Controlling by Solid State Method.

## **Prerequisites- -**

- Basic Knowledge of Power Electronic Switches and Electrical Machines.

## **Course Outlines--**

| Sr. No. | Course Contents  | No Of Hours |
|---------|--|-------------|
| 1       | <b>Basics of Drives:-</b><br>Introduction of Electric Drives, Components of Electric Drives, Classification of Electric Drives- Group Drive, Individual Drive, Multi Motor Drive, Classification of Control Schemes- Manual Control, Semi-Automatic Control, Automatic Control, Classification of Methods for Speed Control- The First Group, The Second Group, The Third Group, The Fourth Group, The Fifth Group.  | 5           |
| 2       | <b>Speed-Torque Characteristic of Motors:-</b><br>Introduction, Basic Parameters, Types of Loads, Quadrant Diagram, Speed Torque Characteristics - DC Series Motors, DC Shunt Motor, DC Compound Motor, Induction Motor, Types of Braking - DC Series Motor, DC Shunt Motor, DC Compound Motor, Induction Motor.   | 6           |
| 3       | <b>Speed Control of DC Motors:-</b><br>Introduction, Basic Parameters, Speed Control of DC Shunt Motors- Ward-Leonard Method, Buck-Boost Control, Speed Control of DC Series Motors- Series Parallel Control, Solid State DC Drives, Thyristor Bridge Rectifier Circuits, Chopper Circuits, Dc Motor, Stepper Motors- VR Stepper Motor, Permanent Magnet(PM) Stepper Motor, Hybrid Stepper Motor, Stepper Motor Control  | 10          |
| 4       | <b>Induction Motor Drives:-</b><br>Introduction, Parts of Induction Motors, Analysis and Performance of Three phase Induction Motor, Operation of Induction Motor on Unbalanced Source Voltage and Single Phasing, Comparison of IM Operation With Balanced Source Voltage and Unbalanced Source Voltage, Analysis of Induction Motor with Non Sinusoidal Source Voltages Starting, Types of Induction Motor Control, Stator Voltage Control of Induction Motor, | 11          |

|   |  |    |
|---|--|----|
|   | 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, Multi quadrant Drives, Rotor Resistance Control- Slip - Torque Characteristics, Rotor Choppers, Torque Equations, Constant Torque Operation, Closed Loop Control of Rotor Resistance Through Power Electronic Modulator |    |
| 5 | <b>Synchronous Motor Drives:-</b><br>Introduction, Speed Control of Synchronous Motors, Adjustable Frequency Operation of Synchronous Motors, Principles of Synchronous Motor Control , Voltage 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.  | 10 |
| 6 | <b>Industrial Application:-</b><br>Rolling Mills Drives- Reversing Mill Drives, Continuous Mills, Cement Mills- Mill Drive, Blower Drives, Cyclone, Coal Mines- Drum Winder, Shearer, Conveyors in Long Wall System, Auxiliary Motors, Paper Mills- Pulp Manufacture, Paper Manufacture, Paper Mill Drives and Control, Machine Tool Drives- Drilling M/C, Grinder M/C, Hydraulic M/C, Textile Mills- Spinning Mills, Loom Motors.   | 10 |

### List of Experiments:-

- To Study about Different Types of Drives.
- To Study about Speed-Torque Characteristic of Different Types of AC and DC Motors.
- To Study Speed Control of DC Shunt Motors with Ward-Leonard Method and Buck-Boost Control.
- To Study about Speed Control of Permanent Magnet (PM) Motors.
- To Study Analysis of Induction Motors with Non-Sinusoidal Wave Forms.
- To Study Operation with Unbalance source voltage.
- To Study about Adjustable Frequency Operation of Synchronous Motors.
- To Study about Self-Controlled Synchronous Motor with Electronic Commutation.
- Prepare a Report on Drives Used in Rolling Mills/Cement Mills/Tools Drives/Textile Mills/Paper Mills/ Coal Mines.
- Prepare a Technical Report on DC Motor Drives.(By Suitable Visit)
- Prepare a Technical Report on Induction Drives.(By Suitable Visit)

### Learning Outcomes:-

- Differentiate Different Types of Drives.
- Knowledge of Solid State Controller for Different Types of Drives.
- Calculation on Speed Control of Motors.

### Reference books:-

- Electric Drives by **N.K.DE & P.K.SEN**, Prentice-hall India.
- Modern Power Electronics and AC Drives, by **B K Bose**. PHI Publication
- Power Semiconductor Controlled Drives. by **G. K. Dubey**.
- Fundamentals of Electrical Drives, by **G K Dubey**, Nasora Publication house New Delhi 2<sup>nd</sup> Edition
- Electrical Drives, 2nd ed. by **S.A. Nasar, Boldea**.