



## JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

Year & Sem – B.Tech 3 year, Sem-VI

Subject –ELECTRICAL DRIVES

Unit – I

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DESIGNATION –Assistant Professor

DEPARTMENT-Electrical Engineering

# ***VISSION AND MISSION OF INSTITUTE***

## **Vision of Jaipur Engineering College and Research Centre**

To become a renowned centre of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

## **Mission of Jaipur Engineering College and Research Centre**

**M1.** Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.

**M2.** Identify, based on informed perception of Indian, regional and global needs, areas of focus and provide platform to gain knowledge and solutions.

**M3.** Offer opportunities for interaction between academia and industry.

**M4.** Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

# ***VISSION AND MISSION OF DEPARTMENT***

## **Vision of Department of Electrical Engineering**

The Electrical Engineering Department strives to be recognized globally for outcome based technical knowledge and to produce quality human being who can manage the advance technologies and contribute to society.

## **Mission of Department of Electrical Engineering**

**M1.** To impart quality technical knowledge to the learners to make them globally competitive Electrical Engineers.

**M2.** To provide the learners ethical guidelines along with excellent academic environment for a long productive career.

**M3.** To promote industry-institute relationship.

# *Course Outcome for ELECTRICAL DRIVES*

- CO1: Acquire detailed knowledge on DC and AC drive and their modelling for steady-state and transient analysis.
- CO2: Develop capability to choose a suitable motor and Power Electronics Converter from a description of drive requirement.
- CO3: Develop design knowledge on how to design the speed control and current control loops of an electric motor drive.

# *Syllabus of ELECTRICAL DRIVES*

- Introduction: Objective, scope and outcome of the course.
- DC motor characteristics Review of emf and torque equations of DC machine, review of torque- speed characteristics of separately excited dc motor, change in torque- speed curve with armature voltage, example load torque-speed characteristics, operating point, armature voltage control for varying motor speed, flux weakening for high speed operation
- Chopper fed DC drive Review of dc chopper and duty ratio control, chopper fed dc motor for speed control, steady state operation of a chopper fed drive, armature current waveform and ripple, calculation of losses in dc motor and chopper, efficiency of dc drive, smooth starting..
- Multi-quadrant DC drive Review of motoring and generating modes operation of a separately excited dc machine, four quadrant operation of dc machine; single-quadrant, two-quadrant and four-quadrant choppers; steady-state operation of multi-quadrant chopper fed dc drive, regenerative braking

# Syllabus of *ELECTRICAL DRIVES*

- Closed-loop control of DC Drive Control structure of DC drive, inner current loop and outer speed loop, dynamic model of dc motor – dynamic equations and transfer functions, modeling of chopper as gain with switching delay, plant transfer function, for controller design, current controller specification and design, speed controller specification and design
- Induction motor characteristics Review of induction motor equivalent circuit and torque-speed characteristic, variation of torque-speed curve with (i) applied voltage, (ii) applied frequency and (iii) applied voltage and frequency, typical torque-speed curves of fan and pump loads, operating point, constant flux operation, flux weakening operation, vector control of IM, Direct torque control of IM.
- Scalar control or constant V/f control of induction motor Review of three-phase voltage source inverter, generation of three- phase PWM signals, sinusoidal modulation, space vector theory, conventional space vector modulation; constant V/f control of induction motor, steady-state performance analysis based on equivalent circuit, speed drop with loading, slip regulation 06 8 Control of slip ring induction motor Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, slip power recovery