

ELECTRIC DRIVES

Course Code	23EE4602A	Year	III	Semester	II
Course Category	Professional Elective -III	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	PE,DM&T, I&SM
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Demonstrate the fundamentals of electric drive and different electric Braking methods. (L2)
CO2	Analyze the concepts of Load torque, Four quadrant operation and braking methods of electric drive. (L4)
CO3	Analyze the operation of three-phase converter fed dc motors and four quadrant operations of dc motors using dual converters, DC-DC converter fed control of dc motors in various quadrants of operation. (L4)
CO4	Analyze the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters and differentiate the stator side control and rotor side control, concepts of speed control of synchronous motor with different methods. (L4)
CO5	Ability to understand the Fundamentals, Rectifiers, Choppers, Inverters and AC to AC converters applied to Electrical motors and submit a report.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	2	3				1	1					2	3	2
CO3		3										2	3	2
CO4		3										2	3	2
CO5									3	3			3	2

SYLLABUS		
Unit No.	Contents	Mapped CO
I	Fundamentals of Electric Drives Electric drive and its components– Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of	CO1 CO2 CO5

	drive (hoist control) – Braking methods: Dynamic Braking, Plugging and Regenerative Braking – Numerical problems.	
II	Converter Fed DC Motor Drives 3-phase half and fully-controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque characteristics and expressions – 3-phase Dual converter fed DC motor drives – Numerical	C01 C03 C05
III	DC–DC Converter Fed DC Motor Drives Single quadrant, two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous Current Mode of operation - Output voltage and current waveforms – Speed-torque characteristics and expressions – Closed loop operation (qualitative treatment only) – Numerical problems.	C01 C03 C05
IV	Control of 3-phase Induction motor Drives Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop V/f control of induction motor drives (qualitative treatment only). Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics– Numerical problems.	C01 C04 C05
V	Control of Synchronous Motor Drives Separate control of synchronous motor – self-control of synchronous motor employing load commutated thyristor inverter - closed loop control of synchronous motor drive (qualitative treatment only)– PMSM: Basic operation and advantages – Numerical problems.	C01 C04 C05

Learning Resources	
Text Books:	
1. Fundamentals of Electric Drives – G K Dubey - Narosa Publications - 2 nd edition – 2002.	
2. Power Semiconductor Drives - S.B.Dewan - G.R.Slemon - A.Straughen - Wiley India - 1984.	
Reference Books:	
1. Electric Motors and Drives Fundamentals - Types and Applications - by Austin Hughes and Bill Drury - Newnes.4th edition - 2013.	
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications - 1987.	
3. Power Electronic Circuits - Devices and applications by M.H.Rashid - PHI - 3 rd edition - 2009.	
E-Resources:	
1. https://archive.nptel.ac.in/courses/108/104/108104140	
2. https://nptel.ac.in/courses/108104011	