

DRIVES AND ACTUATORS FOR ROBOTICS

Course Code		Year	IV	Semester	I
Course Category	PE -IV	Branch	ME	Course Type	Theory
Credits	3	L – T – P	3 – 0 – 0	Prerequisites	Basic Electrical Engineering
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

CO	Statement	Skill	BTL	Units
CO1	Explain and apply the working, triggering, and protection of relays, SCRs, MOSFETs, IGBTs, and associated circuits.	Understand, Apply, Communication	L2–L3	1
CO2	Analyze motor-load dynamics and select suitable motors based on drive requirements.	Analyze, Apply, Problem Solving	L3–L4	2
CO3	Explain and implement DC motor operation and single/three-phase drives using H-bridge control.	Understand, Apply, Implementation	L2–L3	3
CO4	Apply and analyze different speed control techniques of three-phase induction motors using AC drives.	Apply, Analyze, Problem Solving	L3–L4	4
CO5	Analyze and apply the construction, operation, and control methods of stepper, servo, and BLDC motors.	Understand, Apply, Analyze	L3–L4	5

Contribution of Course outcomes towards achievement of Program outcomes & Strength of correlations (High:3, Medium: 2, Low:1)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	2					1		3	
CO2	3	3	2	2	3					1		3	2
CO3	3	2	2	2	3					1		3	2
CO4	3	3	3	2	3				2	2		3	3
CO5	3	3	3	3	3				2	2		3	3

Syllabus		
UNIT	Contents	Mapped CO
I	RELAY AND POWER SEMI-CONDUCTOR DEVICES: Study of Switching Devices – Relay and Types, Switching characteristics -BJT, SCR, TRIAC, GTO, MOSFET, IGBT and IGCT-: SCR, MOSFET and IGBT - Triggering and commutation circuit - Introduction to Driver and snubber circuits	CO1
II	DRIVE CHARACTERISTICS: Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, torque, and Direction starting & stopping – Selection of motor	CO2
III	DC MOTORS AND DRIVES: DC Servomotor - Types of PMDC & BLDC motors - principle of operation- emf and torque equations - characteristics and control – Drives- H bridge - Single and Three Phases – 4 quadrant operation – Applications	CO3

IV	AC MOTORS AND DRIVES: Introduction – Induction motor drives – Speed control of 3-phase induction motor – Stator voltage control – Stator frequency control – Stator voltage and frequency control – Stator current control – Static rotor resistance control – Slip power recovery control.	CO4
V	STEPPER AND SERVO MOTOR: Stepper Motor: Classifications- Construction and Principle of Operation – Modes of Excitation Drive System- Logic Sequencer - Applications. Servo Mechanism – DC Servo motor-AC Servo motor – Applications.	CO5

Learning Resource

Text books:

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| <ol style="list-style-type: none"> 1. Bimbhra B.S., "Power Electronics", 5th Edition, Kanna Publishers, New Delhi, 2012. 2. Mehta V.K. & Rohit Mehta, "Principles of Electrical Machines", 2nd Edition, S.Chand & Co. Ltd., New Delhi, 2016. |
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Reference books

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| <ol style="list-style-type: none"> 1. Gopal K. Dubey, "Fundamentals of Electrical Drives", 2nd Edition, Narosal Publishing House, New Delhi, 2001. 2. Theraja B.L. & Theraja A.K., "A Text Book of Electrical Technology", 2nd Edition, S.Chand & Co. Ltd., New Delhi, 2012. 3. Singh M.D. & Kanchandhani K.B., "Power Electronics", McGraw Hill, New Delhi, 2007 |
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