GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: EngineeringLevel: Master

Branch: Instrumentation and control (Applied instrumentation) (03)

Course / Subject Code :ME01067051

Course / Subject Name :Advance Industrial Drives and Control

w. e. f. Academic Year:	2024-25
Semester:	I
Category of the Course:	Program Elective II

Prerequisite:	Electrical Machine & Power Electronics
Rationale:	This course provides an overview and fundamentals of various electrical drives which includes its modelling and also different control strategies. Also covers special industrial drives and its control methods.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Understand modelling of various electric motors.
02	Understand characteristics of various electric motors.
03	Understand different speed control techniques for DC motor, induction motor and synchronousmotor.
04	Understand various advanced control technique like MARS.
05	Understand speed control techniques of advanced electric motors like BLDC, SRM and stepper motor.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	30	20	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	Introduction: Classification of Electric Drives, Requirements of Electric Drives , Modelling of dc machines, Modelling of induction machine, Modelling of synchronous machine	08	20%
2	DC motor drives : Speed-torque characteristics DC shunt, PMDC and series motors ,Dynamic model, Speed and position control methods	06	15%
3	Induction Motor Drive, Scalar control of induction motor, Torque-Speed Characteristics, Power-Flow Diagram, Direct-On-Line (DOL) Starting, Star-Delta Starting, Autotransformer Starting, Rotor Resistance Control, Different Speed Control Techniques, Measurement of Motor Parameters, ,Principle of vector control, sensor less control and flux observers, model reference adaptive system (MARS), Direct torque and flux control of induction motor, Role of AI and Machine Learning in Motor Control	12	25%
4	Control of Synchronous Motor, Self-controlled synchronous motor, Vector control of synchronous motor, Cycloconverter-fed synchronous motor drive, Control of synchronous reluctance motor	08	20%
5	Control of Special Electric Machines, Permanent magnet synchronous motor, Brushless dc motor, Switched reluctance motor, Stepper motors and control	10	20%

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15%	**15%**	**20%**	**20%**	**15%**	**15%**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

Reference Books:

1. P.C. Krause, O. Wasynczuk, and S. D. Sudhoff, "Analysis of Electric Machinery", 2nd Edition,WILEY INDIA.
2. R. Krishnan, "Electric Motor Drives: Modelling, Analysis and Control", Prentice Hall.
3. B. K. Bose, "Modern Power Electronics and AC Drives", Pearson Education.
4. Peter Vas, "Artificial-Intelligence-based Electrical Machines and Drives: Application of Fuzzy, Neural, Fuzzy-Neural, and Genetic-Algorithm-based Techniques"

List of Experiments:

1. To model DC shunt machine.
2. To model DC series machine.
3. To model induction machine.
4. To model synchronous machine.
5. To simulate V/f control technique for induction machine.
6. To simulate vector control technique for induction machine.
7. To simulate DTC technique for induction machine.
8. To simulate rotor resistance control of wound rotor for induction machine.
9. To simulate vector control technique for induction machine.
10. To study BLDC motor drive.
11. To study SRM drive.
12. To study stepper motor control techniques.

List of Open Source Software/learning website:

1. Scilab
2. www.nptel.ac.in/

CO- PO Mapping:

Semester ___	**Course Name (Course Code:)**											
	POs											
Course Outcomes												
CO1	3			2								
CO2	3	2										
CO3			3		2				1			
CO4				2			3				2	
CO5		2						2		2		2

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

Any Other:

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