



C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: -Instrumentation & Control Engineering
SEMESTER: - VIII
CODE: - 4TE08MCN1
NAME: - Motion Control

Teaching & Evaluation Scheme

Subject Code	Subject Name	Teaching Hours/Week				Credits	Evaluation Scheme/Semester							
		Th	Tu	Pr	Total		Theory				Practical			Total Marks
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE08MCN1	Motion Control	4	0	2	6	5	30	1.5	70	3	---	20	30	150

OBJECTIVES

- To acquaint the students with different strategy of Motion Control used in industries for position and velocity based machining system and robotics.

PRE-REQUISITES

- Basics of dc motor and mechanical system,

COURSE OUTLINES

Sr. No.	Course Contents	No. of Hours
1.	Incremental Motion Control: Introduction Mathematical Modeling Of Mechanical System Elements, Analysis Of Mechanical Systems, Incremental Motion, A Typical Incremental Motion Control Problem	4
2.	Sensors And Encoders: Introduction, Potentiometers, The Incremental Encoders, Resolvers As Incremental Encoders, Magnetic Pickups As Encoders	3
3	D.C. Motors In Incremental Motion Systems: Introduction, Operation Principle, Basic Classes of D.C. Motors, Selection Criteria For Incremental Motion Applications, Conclusion.	5
4	Torsional Resonance in High- Performance Incremental Motion Systems: Introduction, The Effects Of Torsional Resonance On The System Response, Torsional Resonance In Two-Body Structures, Effects Of Torsional Resonance On System Stability, Techniques For Minimizing Resonance Effects.	3

5	Linear D.C. Servo Amplifiers: Introduction, Uni-directional Servo Amplifiers, Bi-directional Servo Amplifiers, Power Amplifier Design Considerations, Cross-over Distortion In Power Amplifiers, Current Limiting Techniques, Input-Output Relationships in Linear Amplifiers, Conclusions	7
6	Pulse-Width Modulated Amplifier For D.C. Servo Systems: Introduction, Modes Of Operation, Bi-Polar PWM Amplifiers, Uni-Polar PWM Amplifiers, Limited Uni-Polar PWM Amplifiers, Special Features, Summary	6
7	Velocity Control Systems: Introduction, System Block Diagram, System Design And Analysis, Velocity Variation	2
8.	Position Control System: Introduction, Position Control System With Tachometer Feedback, Position Control Systems Without Tachometer Feedback	2
9.	Phase-Locked Servo Systems: Introduction, System Model, System Analysis, System Design	3
10	Introduction-step motors Application of step Motors, Advantages and disadvantages of step Motors, Types of Step Motors, Step Motor Performance characteristics, Solenoid-Ratchet Types of Step Motors, Variable-Reluctance Types of Step Motors, Permanent-Magnet Types of Step Motors, Electromechanical Types of Step Motors, Electro hydraulic Step Motor, Conclusion	5
11.	Drive Circuitry For Step Motors Introduction, Sequence Logic, Power Drivers, Pulse Sources	4
12.	Step Motor Selection Introduction, Step angle Resolution, Torque Requirements, Pulling Rate versus Load inertia characteristics, Damp response time versus Load inertia characteristics, Step angle accuracy, Power input Limitation, Temperature Limitation, Heat dissipation Limitation, Environmental Factors, Space Limitation, Cost considerations, Mounting Provisions, Selecting Gearing for use with Step Motors	5
13	Closed Loop Control Of Step Motors Introduction, The Encoder, The Switching angle of the Lead angle, Direction sensing, effect of Lead angle in Closed loop control of Step Motor, Effect of Switching angle and pulse injections on the closed loop response of four phase step motors, Closed loop control of Step Motor with time Delayed feedback, Experimental result on close loop Step Motor Control, A close loop point to point controller with encoder feedback	7

Learning Outcomes: Students would be able to understand the fundamentals of Motion control used in machining system and robotics

Books Recommended

1. Incremental Motion Control by B. C. Kuo Vol -1; SRL Publishing Company –Illinois
2. Incremental Motion Control by B. C. Kuo Vol - II; SRL Publishing Company –Illinois
3. Industrial Electronics by Thomas E. Kissell, Prentice – Hall Publication