

Sardar Patel Institute of Technology Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India

(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	Т	P	L	Т	Р	Total
EXC8043	Digital Control System	4			4			4
		Examination Scheme						
		ISE		MSE	ESE			
		10		30	100 (60% Weightage)			tage)

Pre-requisite Course Codes		se Codes	EXC404: Principles of Control System				
_			EXC504: Signals and Systems				
After successful completion of the course, student will be able to							
Course Outcomes	CO1	Differentiate between analog and digital control and importance of digital					
		control					
	CO2	Analyze t	he model of digital control system				
	CO3	Analyze t	he digital control systems				
	CO4	Design di	gital controllers				

Module No.	Unit No.	Topics		Hrs.		
1		Introduction		12		
	1.1	Why digital control system? Advantages and limitations, comparison				
		of continuous and discrete data control, block diagram of digital				
	1.2	Data conversion and quantization sampling and reconstruction of				
		analog signal, zero and first order hold				
	1.3	Impulse invariance, bilinear transformation, finite difference approximation of derivatives				
2		Modeling of Digital Control System		04		
	2.1	Linear difference equation, pulse transfer function, input output model	1,2,3			
	2.2	Examples of first order continuous and discrete time systems				
	2.3	Signal flow graph applied to digital control system				
3		Time Domain Analysis and Stability of Digital Control System		08		
	3.1	Mapping between s plane and Z plane, Jury's method, R. H. criteria	1,2,3			
	3.2	Comparison of time response of continuous and digital control system				
	3.3	Steady state analysis of digital control system, effect of sampling on				
		transient response				
4		State Space Analysis		08		
	4.1	Discrete time state equation in standard canonical form, similarity	1,2,3			
	4.2	State transition matrix, solution of discrete time state equation				
	4.4	Dispersization of continuous state space model and its solution				
5	4.3	Discretization of continuous state space model and its solution.		10		
5	F 1	Fore Fracement and Observer Design	2.4	10		
	5.1	observability observability	2,4			



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	5.2	Design of controller using pole placement method, dead beat controller design		
	5.3	Concept of duality, state observer design, concept of multi rate output feedback based state estimation		
6		Transfer Function Approach to Controller Design		10
	6.1	Control structures, internal stability	1,3	
	6.2	Internal model principle and system type, well behaved signals		
	6.3	Discretization of PID controllers, pole placement controllers with		
		performance specifications		
			Total	52

References:

- [1] M. Gopal, "Digital Control and State Variable Methods", McGraw Hill companies, 3rd edition, 2009.
- [2] K. Ogata, "Discrete-Time Control Systems", PHI, Second Edition.
- [3] B. C. Kuo, "Digital Control Systems", Oxford University press, Second Edition.
- [4] K. M. Moudgalya, "Digital Control", Wiley India.