



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	T	P	L	T	P	Total
EXC602	Advanced Instrumentation System	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

Pre-requisite Course Codes	
After successful completion of the course, student will be able to	
Course Outcomes	CO1 Identify process control system components and their applications.
	CO2 Apply the knowledge of Pneumatic and Hydraulic components in Instrumentation Process System.
	CO3 Discuss principles of transmission and conversion of process parameters to electrical and vice versa.
	CO4 Decide the appropriate types of controllers and their tuning methods to build the process control system

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Concepts of Advancement in Instrumentation		06
	1.1	Data acquisition and data logging, telemetry in measurement, basic requirement of control system and components	7	
2		Pneumatic Components		12
	2.1	ISO symbols, pneumatic air supply system, air compressors, pressure regulation devices, directional control valves	4	
	2.2	Special types of pneumatic valve: pilot-operated valves, non-return valves, flow control valves, sequence valves, and time delay valve	4	
	2.3	Single and double acting linear actuators, special type of double acting cylinder, rotary actuators, air motors	4	
3		Hydraulic Components.	4	06
	3.1	Hydraulic pumps, Pressure regulation method, loading valves	4	
	3.2	Hydraulic valves and actuators, speed control circuits for hydraulic actuators	4	
	3.3	Selection and comparison of pneumatic, hydraulic and electric systems	4	
4		Transmitters and Converters		12
	4.1	Electronic versus pneumatic transmitters, 2-wire; 3-wire and 4-wire current transmitters	4,1	
	4.2	Electronic type: temperature, pressure, differential pressure, level, flow transmitters and their applications Smart (Intelligent) transmitters, Buoyancy transmitters and their applications.	4,1	



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	4.3	Converters: Pneumatic to Electrical and Electrical to Pneumatic converters	4,1	
5		Process Control Valves		08
	5.1	Globe, ball, needle, butterfly, diaphragm, pinch, gate, solenoid, smart control valves and special designs of globe valves	4	
	5.2	Flow characteristics, control valve parameters, control valve capacity, valve rangeability, turn-down, valve size, valve gain	4	
	5.3	Selection criteria, specifications and installation of control valves	4	
	5.4	Valve Positioners: Necessity, types-motion balance and force-balance, effect on performance of control valve	4	
	5.5	Control Valve Actuators: Electrical, pneumatic, hydraulic, electro-mechanical, digital actuators. selection criteria of valve actuators	4	
6		Controllers and Controller Tuning		08
	6.1	Continuous and discontinuous controller: proportional controller, proportional band, RESET controller, rate controller, composite controller, cascade controller, feed-forward controller	4,1	
	6.2	Need and different method of controller tuning	4,1	
			Total	52

References:

- [1] Bella G. Liptak, "Process Control and Optimization, Instrument Engineer's Handbook", CRC Press , Fourth Edition
- [2] WG Andrews and Williams, "Applied Instrumentation in the process Industries, Vol. - I and II", Gulf Publication
- [3] Terry Barlett, "Process Control System and Instrumentation", Delimar Cengage learning Reprint-2008
- [4] Andrew Parr, "Hydraulics And Pneumatics- A Technician's And Engineer's Guide", Jaico Publishing House, Mumbai
- [5] C.D.Johnson, "Process Control and Instrument Technology", Tata Mcgraw Hill.
- [6] J. W. Hatchison, "ISA Handbook of Control Valves", ISA, Second Edition.
- [7] A. K. Sawhney, Electrical & Electronic Instruments & Measurement, Dhanpat Rai and Sons, Eleventh Edition.