BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
HYDERABAD CAMPUS
SECOND SEMESTER 2017-2018
Course Handout

07-01-2019

Course No.	**: INSTR F343**
Course Title	**: Industrial Instrumentation & Control**
Instructor-in-charge	**: Balasubramanian M**
Instructor	**: Balasubramanian M**

1.   Scope and Objective of the course
This course offers study of various aspects of automatic control for industrial processes, including some recent developments in the field of process control.

2.   Course Description :
Introduction to process control; Elements of process loop; Controller principle; Hydraulic, pneumatic, electronic controllers; Controller tuning; Final control elements; Control loop characteristics; Complex control systems; Intelligent controllers; Programmable logic controllers; Distributed control systems; Digital control principles;

3.   Text Book :
Surekha Bhanot, *Process Control: Principles and Applications,* Oxford University press, Fourth Impression 2010

4.   **Reference Book**:
R1   C.D. Johnson, *Process Control Instrumentation Technology*, Prentice Hall of India, New Delhi , 1993
R2   Liptak B.G., *Process Control: Instrument Engineer's handbook,* Butterworth Heinemann
R3   Krishan Kant, *Computer Based Industrial Control*, Prentice Hall of India, New Delhi, 1997
R4 Stephanopoulos George, *Chemical Process Control*, Prentice Hall of India
R5 Ogata K., *Modern Control Engineering*, Pearson Education Asia

5. **Course plan**

Lecture No.	Learning Objective	Topics to be covered	Chapter in the Text Book
1,2	To appreciate the needs, objectives of process control	Basic Control loop, variables, requirements, aims, parameters, dynamics of the process	T-CH1 R4(1.9)
3	To understand the dynamics of processes	Terms, concepts used in process dynamics	T-CH2
4	To understand/review the concepts of Transfer function	Transfer functions, block diagram and signal flow representation	R5-CH4
5	To understand need and	Model of lumped and	T-CH2, R3 –

	concept of mathematical modeling	distributed parameter systems	CH11, R5-CH2,3&4
6,7	To understand steady state and transient analysis	Transient and steady state analysis of first order, second order and higher order systems and numerical to highlight concepts	R5-CH5
8	To understand different controller modes	On-off, on-off with neutral zone	T-CH3 , R4(9), R3 – CH1
9,10	To understand different controller modes	Proportional, Integral, derivative, PI, PD, PID	T-CH3, R4(9), R3 – CH1
11,12	To learn dynamic behavior of feedback controlled systems	Effect on dynamic behavior of process with different controller modes in closed loop with	T-CH4, R4(14)
13	To learn about controller tuning	Ziegler, Cohen-Coon, Integral performance	T-CH4, R4
14	To learn about DDC loop	Sampling and reconstruction, DDC structure, position & velocity algorithm	T-CH5
15	To realize controller modes in pneumatic controllers	Controller modes in Pneumatic controllers	T-CH6, R5 (4.3)
16	To realize controller modes in hydraulic controllers	Controller modes in Hydraulic controllers	T-CH6, R5 (4.4)
17	To realize controller modes in electronic controllers	Controller modes in Electronic controllers	T- CH7, R1(10.3)
18,19	To learn the evolution, hardware of Programmable Logic Controllers	PLC vs relay Logic, PLC vs PCs, hardware components	T-CH13, R3(5),R2
20,21	To learn ladder diagram programming	Ladder diagram, selection of PLCs	T-CH13, R3(5),R2
22	To learn application of AI techniques in process control	Role of AI	T-CH14, R3(13),R2
23,24	To learn ES structure & Application	ES structure, Design & Applications	T-CH15, R3(13)
25,26	To ANN concepts	Neural networks – structure, applications	T-CH16, R3(18), R2
27,28	Learning algorithms	BPA, learning	T-CH16, R3, R2
29	Case studies	Examples, Matlab simulation	T-CH16
30,31	To learn concept & applications of FLC	Fuzzy controllers	T-CH17, R3(13),R2
32	To learn about different final control elements	Functions of control valves, Types of control	T-CH8, R3 – CH4

		valves, actuators	
33	To understand P&I diagrams	Draw P&I diagrams	T-CH9
34,35	To understand complex control schemes	Cascade control , Ratio control,	T-CH10, R4(20, 21)
36	To understand complex control schemes	Feedforward, Adaptive control, Inferential, Model reference adaptive control, Self tuning regulator	T-CH10, R4 (21)
37-38	To understand complex control schemes	Override, Auctioneering, Split Range	T1-CH11, R4(22)
39-40	To understand interaction and decoupling of control loops	Design of cross controllers and selection of loops using RGA	T-CH12, R4(24)
41-42	To understand distributed digital control systems	History, functional requirements, system architecture, configuration	T-CH18, R3(6),R2

6. Evaluation Scheme

Components	Duration	Weightage	Marks	Date&Time	Remarks
Mid-Sem Test	90 mts	30%	75	14/3 9.00 - 10.30AM	Closed Book
Surprise Quiz	-	10%	30		Closed Book
Assignment	-	20%	60		Open Book
Comprehensive	3 Hrs	40%	120		Closed Book
Total		100%	300	08/05 FN	

7. **Chamber Consultation Hour**   **:** To be announced in the class.
8. **Course Notices:** Notices will be displayed in CMS.
9. **Make-up Examination**: Make-up will be given on extremely genuine grounds only. Prior application and approval should be made for seeking the make-up examination
10. **Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
INSTR F343