

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
Department of Electronics & Computer Science

THEORY LESSON PLAN FOR ISD (ELX 701)

Class & Division	B.E. (Electronics Engineering) – Semester VII		
Academic Term	1 st July 2019 to 18 th October 2019 (1 st Half / Odd Term)		
Subject Name	Instrumentation System Design (ISD) – ELX 701		
Faculty I/C	Jayen Modi (Shared with Dr. Deepak V. Bhoir)		
Periods (Hours) per week	Lectures	4 Hours / Week (Shared 2 Hours / Week)	
	Practicals	02 Hours / Week	
	Tutorials	---	
Evaluation System		Hours	Marks
	Theory Examination	3	80
	Internal Assessment	1	20
	Practical Examination	---	25
	Oral Examination	---	---
	Term Work	---	25
	Total	---	150
Time Table	Days of the Week	Timings	
	Wednesdays	02:30 pm to 03:30 pm	
	Fridays	08:45 am to 09:45 am	

COURSE CONTENTS & LESSON PLAN

Week No.	Lecture No.	Dates		Topics Planned to be Covered	Course Outcomes (CO) Addressing	Programme Outcomes (PO)	Assignments / Experiments	Teaching Aids	Remarks
		Scheduled	Conducted						
1	1	02/07/2019		Introduction to electrical actuators – relays & solenoids with their block / circuit diagram, theory of operation & working, its advantages & disadvantages	ELX 701.2	PO-1		PPT	Hand-outs Notes
1	2	05/07/2019		Introduction to electrical actuators – AC, DC & stepper motors with their block / circuit diagram, theory of operation & working, advantages & disadvantages	ELX 701.2	PO-1		PPT	Hand-outs Notes
2	3	09/07/2019		Generalized block diagram of typical pneumatic system, the different components / elements, theory of operation, working, filter-regulator-lubricator (FRL) unit	ELX 701.2	PO-1	Experiment No. 1	Chalk, Duster & Black-board	
2	4	12/07/2019		Different types of pneumatic compressors – piston, screw & vane with their construction, diagram, theory of operation, its advantages & disadvantages	ELX 701.2	PO-1		PPT	Hand-out Notes

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
Department of Electronics & Computer Science

3	5	17/07/2019		Rotary actuator, single acting cylinder & double acting cylinder with diagrams, theory of operation & working, advantages & disadvantages of typical pneumatic systems	ELX 701.2	PO-1		PPT	Hand-out Notes
3	6	19/07/2019		Generalized block diagram of typical hydraulic system, theory of operation & working, different components / elements, its advantages & disadvantages	ELX 701.2	PO-1	Experiment No. 2	Chalk, Duster & Black-board	
4	7	24/07/2019		Hydraulic actuators – hydraulic pumps & valves (global, ball, needle, butterfly, gate, diaphragm & pinch) with their diagrams, theory of operation & valve characteristics	ELX 701.2	PO-1		PPT	Hand-out Notes
4	8	26/07/2019		Cavitation & flashing with their remedies, pressure drop across valve & leakage, valve noise, flow characteristics on load changes, control valves parameters, control valves sizing, valve calibration, digital control valves, selecting control valves	ELX 701.2	PO-1		PPT	Hand-out Notes
5	9	31/07/2019		Principles of analog & digital signal conditioning – signal level & bias change, linearization, conversion, filtering & impedance matching, concept of loading, comparators & converters	ELX 701.5	PO-2 & PO-3		Chalk, Duster & Black-board	
5	10	02/08/2019		Design of operational amplifier based circuit in instrumentation such as voltage divider biasing circuits & bridge circuits with numerical examples & design based problems	ELX 701.5	PO-4	Experiment No. 3	Chalk, Duster & Black-board	
6	11	07/08/2019		Design of low pass filter (LPF) & high pass filter (HPF), the inverting & non-inverting amplifier, instrumentation amplifiers (3 op-amp) with numerical examples & design based problems	ELX 701.5	PO-4	Experiment No. 4	Chalk, Duster & Black-board	
6	12	09/08/2019		Current to voltage (I to V) converter, voltage to current (V to I) converter, integrator, differentiator & linearization with design based problems & numerical examples	ELX 701.5	PO-2, PO-3 & PO-4		Chalk, Duster & Black-board	
7	--	14/08/2019	14/08/2019	UNIT TEST NO. 1					Academically Off
7	--	16/08/2019	16/08/2019	UNIT TEST NO. 1					Academically Off

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
Department of Electronics & Computer Science

8	13	21/08/2019		Introduction to basic telemetry system – block diagram, the principle of operation, theory of working, different types of the telemetry systems, advantages & disadvantages	ELX 701.3	PO-2 & PO-4		Chalk, Duster & Black-board
8	14	23/08/2019		The 4 mA to 20 mA current loop, block diagram & description, theory of operation / working, 2 wire, 3 wire & 4 wire based transmitters, circuit diagram / block diagram of each case	ELX 701.3	PO-2 & PO-4	Experiment No. 5	Chalk, Duster & Black-board
9	15	28/08/2019		Electronic transmitters for temperature, pressure, level & flow with their individual block diagrams, theory of operation & the working, advantages & disadvantages	ELX 701.3	PO-2 & PO-4		Chalk, Duster & Black-board
9	16	30/08/2019		Current to pressure (I to P) & pressure to current (P to I) type of converters – block diagram / circuit diagram, theory of the operation / working, advantages & disadvantages	ELX 701.3	PO-2 & PO-4		Chalk, Duster & Black-board
10	--	04/09/2019		MID – TERM BREAK				Academically Off
10	--	06/09/2019		MID – TERM BREAK				Academically Off
11	17	11/09/2019		Principle of the pneumatic actuators with flapper – nozzle type example, circuit diagram / block diagram, theory of operation & working, characteristics & applications	ELX 701.2	PO-1 & PO-2		Chalk, Duster & Black-board
11	18	13/09/2019		Principle of the hydraulic actuators with piston – cylinder type example, circuit diagram / block diagram, theory of operation & working, characteristics & applications	ELX 701.2	PO-1 & PO-2		Chalk, Duster & Black-board
12	19	18/09/2019		PC & micro-computer based instrumentation, block diagram & theory of working / operation, features & advances of computer based instrumentation systems, advantages & disadvantages	ELX 701.1	PO-4 & PO-5		Chalk, Duster & Black-board
12	20	20/09/2019		Introduction to concept of virtual instrumentation, examples of virtual instruments, its theory of operation / working, the block diagram of virtual instrumentation system	ELX 701.1	PO-4 & PO-5	Experiment No. 8	Chalk, Duster & Black-board

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
Department of Electronics & Computer Science

13	21	25/09/2019		Calibration of instrumentation systems, principle of calibration, examples of calibration for commonly used sensors such as thermistors, thermocouples & strain gauges	ELX 702.3	PO-4		Chalk, Duster & Black-board	
13	22	27/09/2019		ISO / IEC 17025 – the general requirements for calibration standards, features & description, application of standards to process control industries		PO-10		PPT	Hand-outs Notes
14	--	02/10/2019	02/10/2019	HOLIDAY ON ACCOUNT OF GANDHI JAYANTI					Academically Off
14	23	04/10/2019		Instrumentation standards ISA S82.01 – Safety Standard for Electrical and Electronic Test, Measuring, Controlling Related Equipment		PO-10		PPT	Hand-outs Notes
15	24	09/10/2019		ISA S84.01 – Application of Safety Instrumented Systems for the Process Industries, features & description, application of standards to process control industries		PO-10		PPT	Hand-outs Notes
15	25	11/10/2019		ANSI / NEMA 250 – Enclosures for Electrical Equipment with features & description, application of standard to the process control industries		PO-10		PPT	Hand-outs Notes

List of Reference & Text Books :-

1. B. G. Liptak – Handbook of Instrumentation & Process Control, 4th edition by CRC Press.
2. Andrews & Williams – Applied Instrumentation in Process Industries, 2nd edition by Gulf Publications.
3. Terry Bartlett – Process Control System & Instrumentation, Delmar – Cengage Learning (2008).
4. Andrew Parr – Hydraulics & Pneumatics, 2nd edition by Jaico Publishing House.
5. Curtis D. Johnson – Process Control & Instrumentation, 2nd edition by Tata McGraw Hill.

Internal Assessment (IA) :-

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered as final IA marks.

End Semester Examination :-

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4. Remaining questions will be selected from all the modules.

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
Department of Electronics & Computer Science

Submission & Approval :-

SUBMITTED BY :-	APPROVED BY :-
Prof. Jayen Modi	(i) Prof. K. Narayanan Sign :-
Sign:	(ii) Dr. Sapna Prabhu Sign :-
	(iii) Prof. Shilpa Patil Sign :-
	(iv) Prof. Monica Khanore Sign :-
Date of Submission :- 15 th July 2019	Date of Approval :-
Remarks by PAC (if any) :-	