FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
Department of Electronics Engineering

THEORY LESSON PLAN			
Class & Division	S.E. (Electronics Engineering) – Semester III		
Academic Term	July 2019 – October 2019		
Subject	Electronic Instruments & Measurement (EIM) – ELX 305		
Faculty I/C	Shilpa Patil, Jagruti Nagaonkar		
Periods (Hours) per week	**Lectures**	04 Hours / Week	
	Practicals	02 Hours / Week	
	Tutorials	--	
Evaluation System		**Hours**	**Marks**
	Theory examination	3	80
	Internal Assessment	--	20
	Practical Examination	--	--
	Oral Examination	--	--
	Term work	--	--
	Total	--	100
Time Table	**Days**	**Timings**	
	Monday	1.30 pm to 2.30 pm	
	Tuesday	12:00 noon to 1.00 pm	
	Wednesday	1.30pm to 2.30 pm	
	Friday	9:30 am to 10:30 am	

Lesson Plan by Shilpa Patil

Week No.	**Lecture No.**	**Dates**		**Topics Planned to be Covered**	**Course Outcome (CO)**	**Programme Outcome (PO)**	**Assignments**	**Teaching Aids**	**Remarks**
		Scheduled	**Conducted**						
1	1	03/07/2019		Introduction to the course / subject – EIM (ELX 305) with course objectives, course outcomes (CO) & the mapping with programme outcomes (PO) & academic administration					
2	2	10/07/2019		Block diagram of a generalized instrumentation system with functions of each block, practical / real-life example mapping of all elements (Bourdon Tube Temperature Detector)	ELX 305.1	PO-1		Chalk &Black	
3	3	15/07/2019		Dynamic characteristics of instruments – speed of response, lag, fidelity & dynamic error with description of each; types of standard test input signals	ELX 305.1	PO-1		Chalk &Black	

3	4	19/07/2019		Static Characteristics of instruments – accuracy, precision, linearity, sensitivity, resolution, drift, hysteresis, repeatability, reproducibility, range & span	ELX 305.1	PO-1		Chalk &Black	
4	5	22/07/2019		Numerical example on static & dynamic characteristics of all instruments, discussion on how to identify types of static & dynamic characteristics from observation table of instrument	ELX 305.1	PO-2		Hand-outs	
4	6	26/07/2019		Types of instrument errors – gross errors, systematic errors, instrumental errors, observational error, environmental error & gross errors with their descriptions	ELX 305.1	PO-2		Chalk &Black	
5	7	29/07/2019		Statistical analysis of errors – arithmetic mean, deviations & average deviation, standard deviation with their formulations & numerical examples for each case	ELX 305.1	PO-2		Hand-outs	
5	8	02/08/2019		Introduction to measurement of resistances – Wheatstone Bridge with derivation, output voltage equation, sensitivity of Wheatstone Bridge with numerical examples	ELX 305.2	PO-1		Chalk &Black	
6	9	05/08/2019		Drawbacks of the Wheatstone Bridge, introduction to KelvinBridge, mathematical analysis of the Kelvin's Bridge, along with numerical examples	ELX 305.2	PO-1, PO-2		Chalk &Black	
6	10	09/08/2019		Measurement of L & C – inductance comparison bridges & the capacitance comparison bridges; brief overview about AC bridges, numerical examples for each case	ELX 305.2	PO-1, PO-2		PPT	
7	Unit Test 1								
8	11	19/08/2019		Introduction to Maxwell's Bridge & Hay's Bridge to measure the unknown inductance (L), mathematical analysis of each with their advantages & disadvantages	ELX 305.2	PO-1, PO-2		Chalk &Black	
9	12	26/08/2019		Introduction to the Schering's bridge & Wien's Bridge so as to measure the unknown capacitance (C), the mathematical analysis of each case with advantages & disadvantages	ELX 305.2	PO-1, PO-2		Chalk &Black	

9	13	30/08/2019		The LCR – Q Meter, introduction & internal block diagram, operation & working, mathematical analysis & applications, numerical example on the LCR – Q Meter	ELX 305.2	PO-1, PO-2		Chalk &Black	NPTEL Video
10	Midterm brake								
11	14	09/09/2019		Introduction to the cathode ray oscilloscope (CRO), internal block diagram, description, working & operation, functions of all front panel controls & specifications	ELX 305.3	PO-1	Assignment No. 1	PPT	
11	15	13/09/2019		Types of sweep in CRO, role of delay line in CRO, need for trigger circuit (all with block diagram), working principles & operation for each case	ELX 305.3	PO-1		PPT	
12	16	16/09/2019		Dual beam CRO, internal block diagram, working principle & operation with description, specifications of dual beam CRO with advantages & disadvantages	ELX 305.3	PO-1		PPT	
12	17	20/09/2019		Dual trace CRO, internal block diagram, working principle & operation with description, specifications of dual trace CRO with advantages & disadvantages	ELX 305.3	PO-4		PPT	
13	18	23/09/2019		Measurement of AC & DC voltage, frequency, rise time, fall time & phase difference using cathode ray oscilloscope with numerical examples for each case	ELX 305.3	PO-1, PO-5		PPT	NPTEL Video
14	19	30/09/2019		Digital storage oscilloscope (DSO), internal block diagram & working / operation, features like roll, refresh, storage mode & sampling rate, applications of DSO	ELX 305.3	PO-5		PPT	Video on Applications
14	20	04/10/2019		Chop & Alternate modes in cathode ray oscilloscope (CRO), operation & working with waveforms, Lissajous patterns in the detection of phase & frequency difference	ELX 305.3	PO-4		Chalk & Black Board	Pop Quiz No. 1
15	21	07/10/2019		Poster presentations by students		PO-9, PO-10		Posters	

15	22	11/10/2019		University Papers discussion				Chalk & Black Board	

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Lesson Plan by Jagruti Nagaonkar:

Module 1:Analog and Digital Instruments

	Lecture No.	Date		Topic	Remarks (If any)	Mapped CO	Mapped PO
		Planned	Actual				
	1	4-7-19		Digital voltmeter (DVM) – ramp type with full internal block diagram, working & operation, waveforms, advantages & its disadvantages,		ELX 305.3	PO5
	2	11-7-19		Digital voltmeter (DVM) – dual-slope type with internal block diagram, working & operation, waveforms, advantages & its disadvantages		ELX 305.3	PO5
	3	16-7-19		Integrating and successive approximation DVM with its advantages and disadvantages.		ELX 305.3	PO5
	4	17-7-19		Working of Digital frequency meter and digital phase meter		ELX 305.3	PO5
	5	23-7-19		Working of Digital phase meter and digital time measurment		ELX 305.3	PO5
	6	24-7-19		Low frequency signal generator, function generator & pulse generator with internal block diagram, working & description along with advantages & disadvantages		ELX 305.3	PO5
	7.	30-7-19		Working of RF signal generator and sweep frequency Generator		ELX 305.3	PO5
	8.	31-7-19		Working of basic wave analyzer, frequency selective and heterodyne wave analyzer		ELX 305.3	PO5
	9	6-8-19		Working Harmonic distortion analyzer and spectrum analyzer	Assignment1	ELX 305.3	PO5

Module 2: Transducer for Displacement and Temperature measurment							
	10	7-8-19		Introduction to transducers, characteristics of transducers & sensors, requirements of transducers, classification & their selection for a particular application	**13,14,16 August 2019 :UT2**	ELX 305.4	PO9 and PO10
	11	20-8-19		Temperature – resistance temperature detector (RTD), the thermistors, operation, construction, working principle along with applications		ELX 305.4	PO9 and PO10
	12	21-8-19		Displacement – potentiometers, linear variable differential transformer (LVDT) with construction, operating principle, working & application		ELX 305.4	
	13	27-8-19		Displacement – resistance strain gauge, capacitance sensors with construction, operating principle, working & applications		ELX 305.4	PO9 and PO10
Module 3:Transducer for Pressure,Level and Flow Measurment							
	14	28-8-19		Pressure – pressure gauges, elastic pressure transducers, Bourdon Tube, bellows, diaphragms, construction, working principle of operation & advantages		ELX 305.4	PO9 and PO10
	15	11-9-19		Pressure – McLeod Gauge, Pirani Gauge, construction & operating principles of working, applications, advantages & disadvantages		ELX 305.4	PO9 and PO10
	16	17-9-19		Level – side glass tube method, float type methods with the operating principles, construction, working & description & advantages / disadvantages		ELX 305.4	PO9 and PO1

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	17	18-9-19		Level – ultrasonic type transducers, optical level detectors, operating principle, construction & working, description with advantages & disadvantages	Assignment2	ELX 305.4	PO9 and PO10
	18	24-9-19		Flow – restriction type flow meters, orifice tube, venturi flow meter, construction, description, operating principle, working & applications with advantages / disadvantages		ELX 305.4	PO9 and PO10
	19	25-9-19		Flow – rotameter, electromagnetic flow meter, turbine type flow meters, ultrasonic flow meters, construction, working, operating principle with advantages / disadvantages		ELX 305.4	PO9 and PO10
	20	1-10-19		Revision			
	21	9-10-19		University paper solving			
UT2: 14,15,16 Oct 2019							

Recommended Books:-

1. David A. Bell, Electronic Instrumentation & Measurements, Oxford Publishing, 2nd edition
2. H. S. Kalsi, Electronic Instrumentation, McGraw Hill, 4th edition
3. C. S. Rangan, G.R. Sarma & V.S.V. Mani, Instrumentation Devices and Systems, Tata McGraw Hill, 9th edition.
4. A. K. Sawhney, Electrical & Electronic Instruments & Measurement, Dhanpat Rai & Sons, 11th edition
5. S. K. Singh, Industrial Instrumentation & Control, McGraw Hill, 3rd edition

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. The students need to solve total 4 questions.
3. Q.1 will be compulsory and based on entire syllabus.
4. Remaining questions (Q.2 to Q.6) will be set from all modules.

5. Weightage of each module in question paper will be proportional to the number of respective lecture hours mentioned in the syllabus.

Submission & Approval :-

SUBMITTED BY :-	**APPROVED BY :-**
Shilpa Patil, Jagruti Nagaonkar	(i) Prof. K. Narayanan Sign :-
Sign:	(i) Dr. D.V. Bhoir Sign :-
	(iii) Prof. Monica T. Khanore Sign :-
Date of Submission:- 25th July 2019	**Date of Approval:-**
Remarks by PAC (if any) :-	