



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
ELL34	Electronics Instruments and Measurement Lab	--	--	4	--	--	2	2
		Examination Scheme						
		ISE		ESE		Total		
				Practical	Oral			
		40		--	20	60		

Pre-requisite Course Codes		EL34 (Electronics Instruments and Measurement)
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Describe the working of measuring instruments available in the lab.
	CO2	Find out and verify the manufacturers, make, models, market cost and specifications of the given instrument.
	CO3	Select the suitable test and measuring instrument for the given circuit.
	CO4	Operate the instrument for observing and recording the given signal in time domain and frequency domain.
	CO5	Recognize the importance of calibration of instruments.
	CO6	Validate characteristics of transducer to measure electrical and non electrical quantities.

Teaching Learning Methodology: Role Play Model

a. Instructor:

Responsibilities: Explanation of theoretical background
To provide required sample formats
To guide students in identification of appropriate online material.
Supervision and assessment of overall activity
Summarize the activity

b. First Group of students : Customer

Responsibilities: To finalize specifications of instrument to be purchased
Prepare request for quotations
Prepare the comparative statement
Preparation for purchase order

c. Second Group of students: Manufacturer/Vendor

Responsibilities: To maintain the specifications of the manufactured instruments



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To submit quotations including all applicable taxes
To prepare Invoice as per purchase order

d. Third Group of Students: Sales/Service Engineer

Responsibilities: To demonstrate capabilities of various instruments and convince customer to purchase a particular instrument
To prepare Delivery Challan
Install the instruments and prepare Installation Report,
Demonstrate all the functions and uses of the instrument

Exp. No.	Experiment Details	Ref.	Marks
1	Block diagram based working principle of ammeter, voltmeter and galvanometer. Identification of various electronics and electrical components (resistor, capacitor, inductor, diode, PNP/NPN BJTs, FETs, SCR, Fuse etc.) by manual observation as well as with the help of measuring instruments. Finding their specifications, manufacturers and market cost. Measure resistance with a given ammeter, voltmeter and galvanometer.	1	5
2	Block diagram based working principle of Cathod Ray Oscilloscope. Interpretation and use of various controls of CRO. Finding their specifications, manufacturers and market cost. Identification of faulty/working probe, component identification etc. with CRO. Various types of accessories (types of probes, their compensation etc.) required with CRO. Measurement of different parameters using CRO and obtain Lissageous patterns.	2	5
3	Block diagram based working principle of function generator, signal generator and DSO. Interpretation and use of various controls of function and signal generator. Finding their specifications, manufacturers and market cost. Adjust the various waveforms on a function generator and finding limitations i.e. minimum and maximum output signal parameters values that can be obtained. Obtain the given waveform on function or signal generator and observe its various parameters on DSO.	2	5
4	To compare analog oscilloscope with digital storage oscilloscope and note down the advanced features and functions. Obtain a waveform on 5Digital Storage Oscilloscope and store it in different format on your storage device and observe it on PC. Compare the measurements of	2	5



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	sinusoidal signal on analog CRO with measurement on DSO. Compare features of DSO with different model numbers and find out the difference in cost because of features or added functions.		
5	Introduction to various features and functions of an arbitrary function generator in order to generate common stimulus signals for electronic measurements. Explain the block diagram and basic controls of an arbitrary function generator. Finding specifications, manufacturers, and market cost of AFG. Learn how to generate several basic electronic signals. Learn how to verify the signal's parameters with oscilloscope measurements. Obtain waveforms for a given equation on an Arbitrary Waveform Generator.	2	5
6	Explain working principle of energy meter and wattmeter. Identifications of various terminals of energy meter and wattmeter. Selection of current coil and voltage coil while measuring power. Measurement of power factor using wattmeter, ammeter and voltmeter. Selection of wattmeter, ammeter according to load. Finding specifications, manufacturer, and market cost of wattmeter, voltmeter and ammeter.	1	5
7	Explain working principle of Multimeter. Compare Analog Multimeter and Digital Multimeter by using it to measure resistance, voltage, frequency. Identify the limitations of both while testing diodes, transistors and capacitors. Compare Branded Analog multimeter and Branded digital analog multimeter.	2	5
8	Describe the concept of Q factor and measure parameters for a given RLC circuit on Q meter and also explain the use of frequency meter. Finding specifications, manufacturer, and market cost of Q meter and Frequency Meter.	3	5
9	Differentiate time domain measurement and frequency domain measurement. Obtain analysis for a given signal on Spectrum analyzer for various frequencies. Compare the sinusoidal signal frequency spectrum with different standard signals. Finding specifications, manufacturer, and market cost of spectrum analyzer and vector analyzer.	3	5
10	Explain the various antenna parameters and the related test & measuring instruments. Finding specifications, manufacturer, and market cost of VSWR meter,	4	5



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	Vector network analyzer etc. Record the various parameters for a given antennas with VNA.		
11	Block diagram based working principle of tachometer, lux meter, thermal camera and radiation measurement meter. Identify their specifications in terms of respective unit. Measurement of speed of motor, light intensity in various lab, radiations using related instrument. Compare and comment on measurement at different locations. List different applications where thermal camera can be used. Finding specifications, manufacturer, and market cost of Distortion meter.	3	5
12	Block diagram based working principle of LVDT. Identify the specifications of winding machines for LVDT available in the market and design a simple LVDT using a given core and winding coil. Validate the characteristics of LVDT to measure distance upto 10mm	2	5
13	Explain specifications of given strain gauge. Compare different types of strain gauges available in the local market. Differentiate the given load cell and strain gauge. Obtain the characteristics of weight vs resistance for a given strain gauge. Suggest a circuit to measure weight using strain gauge or load cell.	1	5
14	Comment on the given RTD and LM35 according to the parameters or specifications given in data sheet. Validate the characteristics of RTD and LM35 to measure temperature of a specific range.	2	5
15	Design the bridges to measure unknown resistance, inductor and capacitance. Comment on your bridge designed and its limitations.	2	5
16	Explain specifications of a given ADC IC and measure the resolution of a given ADC IC by applying an input signal of appropriate value. Note down digital outputs for different analog signal in appropriate range using given logic probe and DSO.	3	5
Assessment Marks			80
Total Term Work Marks (80/2)			40



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References:

- [1] W. Cooper, A. Helfric, Electronic Instrumentation and Measurement Techniques, PHI, 4th edition.
- [2] C. S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation Devices and Systems, Tata McGraw Hill, 9th edition.
- [3] A. K. Sawhney, Electrical & Electronic Instruments & Measurement, Dhanpat Rai and Sons, Eleventh ed., 2000.
- [4] Constantine A. Balanis, Antenna Theory: Analysis and Design, Wiley.