

Ramgarhia Polytechnic College,
Phagwara



Electronics and Communication
Engineering Department

Head of Department:	Er. Simranjit Singh
Name of the Faculty:	Er. Gaganpreet Singh
Discipline:	ECE
Semester:	3 rd
Subject:	Electronic Instruments & Measurement
Lesson Plan Duration:	16 Weeks

RATIONALE

In the real world of work, the technician is required to handle wide variety of instruments while testing, trouble shooting, calibration etc. The study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

CO1. Describe and demonstrate the specifications (accuracy, precision, sensitivity, resolution, range, errors, loading effects) of measuring instruments.

CO2. Demonstrate the working principle of measuring instruments like multi-meter, CRO, DSO

CO3. Measure the loading effect of a multi-meter

CO4. Describe the limitation of multi-meter for high frequency measurement
















CO5. Measure frequency, voltage, time period and phase using CRO and DSO

CO6. Measure rise time and fall time using CRO and DSO .

CO7. Demonstrate the working of RF signal generator, pulse generator.

CO8. Identify and differentiate between active and passive transducers and principle of operation of different types transducers.

CO9. Measure distortion of RF signal generator using Distortion factor Meter

PO 	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 							
CO1							
CO2							
CO3							
CO4							
CO5							
CO6							
CO7							
CO8							
CO9							

Syllabus

Units	Details	Hours
1.	<ul style="list-style-type: none"> -Measurement, method of measurement, types of instruments - Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration 	(06 hrs)
2.	Transducers	(14 hrs)

	<ul style="list-style-type: none"> - Distinction between active and passive transducers with examples. Basic requirements of a transducer - Principle of operation of the following transducers and their applications in measuring the physical quantities listed against each one of them: <ul style="list-style-type: none"> i. Variable Resistance Type(strain gauge, thermistor, hygrometer) ii. Variable capacitance type(pressure gauge, dielectric gauge) iii. Variable inductance type(LVDT, Burdon pressure gauge) iv. Others(solid state sensor, thermocouple, piezoelectric device, photoelectric device, proximity probe) 	
3.	<p>Cathode Ray Oscilloscope (12 hrs)</p> <ul style="list-style-type: none"> - Construction and working of Cathode Ray Tube(CRT) - Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls - Specifications of CRO and their explanation - Measurement of current, voltage, frequency, time period and phase using CRO - Digital storage oscilloscope (DSO) : block diagram and working principle 	(12 hrs)
4.	<p>Voltage, Current and Resistance Measurement</p> <ul style="list-style-type: none"> - Principles of measurement of DC voltage, DC current, AC voltage, AC current, - Principles of operation and construction of permanent magnet moving coil (PMMC) instruments and Moving iron type instruments. 	(10 hrs)
5.	<p>Signal Generators and Analytical Instruments</p> <ul style="list-style-type: none"> - Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator - Distortion factor meter - Instrumentation amplifier: its characteristics, need and working 	(10 hrs)
6.	<p>Digital Instruments</p> <ul style="list-style-type: none"> - Comparison of analog and digital instruments - Working principle of ramp, dual slope and integration type digital voltmeter - Block diagram and working of a digital multi-meter - Specifications of digital multi-meter and their applications - Limitations of digital multi-meters. 	(12hrs)

--	--	--

Reference Books:

1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi
2. Electronics Measurement and Instrumentation by Oliver, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi
4. Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
5. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk
2.	PowerPoint Presentation

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct
3.	Board Examination	Direct

4.	Student Feedback	Direct
----	------------------	--------

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
	N/A	N/A	N/A

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	https://nptel.ac.in/

Lesson Plan

Week	Theory		Practical	
	Lecture Day		Practical Day	
1 st	1 st	Introduction to Measurement.	1.	To observe the loading effect of a multi-meter while measuring voltage across a low resistance & high resistance.
	2 nd	Methods of Measurement.		
	3 rd	Types of Instruments.		
	4 th	Specifications of Instruments: Accuracy, Precision, Sensitivity, Resolution, Range.		
2 nd	5 th	Errors in measurement	2.	To observe the limitations of a multi-meter for measuring high frequency voltage.
	6 th	1.Sources of errors, 2.Limiting errors, 3. Loading effect,		
	7 th	Importance and applications of standards and calibration.		
	8 th	Difference between active and passive transducers with examples.		

3 rd	9 th	Basic requirements of a transducer	3.	Measurement and plot of characteristics of optical devices like photodiodes, photocells.
	10 th	Principle of operation of Variable Resistance Type(strain gauge, thermistor, hygrometer)		
	11 th	Principle of operation of: Variable capacitance type(pressure gauge, dielectric gauge)		
	12 th	Principle of operation of: Variable inductance type(LVDT, Burdon pressure gauge)		
4 th	13 th	Principle of operation of: Others(solid state sensor, thermocouple, piezoelectric device, photoelectric device, proximity probe)	4.	REVISION
	14 th	Introduction To CRO. Construction & working Of CRT (Cathode Ray Tube)		
	15 th	Block diagram description of a basic CRO.		

	16 th	Triggered sweep oscilloscope, front panel controls .		
5 th	17 th	Measurement of voltage using CRO.	5.	Characterstics of light operated switch using photo-transistor & LDR.
	18 th	Measurement of Current using CRO.		
	19 th	Measurement of Frequency, time period using CRO.		
	20 th	Measurement of phase using CRO.		
6 th	21 st	Introduction of Digital storage oscilloscope (DSO)	6.	REVISION
	22 nd	Block diagram and working principle Of DSO.		
	23 rd	REVISION		
	24 th	REVISION		
	25 th	1ST Sessional Test (Tentative)		

7 th	26 th	Principle of measurement of DC voltage, DC current.	7.	Measurement of strain using strain gauge.
	27 th	Principle of measurement AC voltage, AC current.		
	28 th	Principles of operation and construction of permanent magnet moving coil (PMMC)		
8 th	29 th	Principles of operation and construction of Moving Iron Type Instruments.	8.	REVISION
	30 th	Introduction to Signal generators.		
	31 st	Explanation of block diagram specifications of low frequency Generators		
	32 nd	Explanation of block diagram specifications of RF Generators		
	33 rd	Explanation of block diagram specifications of Pulse Generators		

9 th	34 th	Explanation of block diagram specifications of Function Generator.	9.	Measurement of temperature using thermistor & thermocouple.
	35 th	REVISION		
	36 th	REVISION		
10 th	37 th	Explanation Of Distortion factor Meter	10.	Revision
	38 th	Explanation Of Distortion factor Meter		
	39 th	Introduction to Instrumentation Amplifier.		
	40 th	Block diagram Working of instrumentation Amplifier.		
11 th	41 st	Characterstics of Instrumentation Amplifier.	11.	Measurement of humidity using humidity meter.
	42 nd	Need Of Instrumentation Amplifier.		
	43 rd	Introduction To Analog & Digital Instruments.		
	44 th	REVISION		

12 th	45 th	REVISION	12.	Revision
	46 th	PTM		
	47 th	2nd Sessional Test (Tentative)		
	48 th	Comparision Of Analog & Digital Instruments.		
13 th	49 th	Working Principle of Ramp Type Digital multimeter.	13.	Measurement of linear & angular displacement.
	50 th	Working Principle of Dual slope Type Digital multimeter.		
	51 st	Working Principle of Integration Type Digital multimeter.		
	52 nd	Introduction tdigital multimeter.		
14 th	53 rd	Block diagram of digital multimeter.	14	Revision
	54 th	Specifications of digital multimeter.		
	55 th	Applications of digital Multimeter.		

				Revision
	56 th	REVISION		
15 th	57 th	REVISION	15.	Measurement of distortion of RF Signal generator using distortion factor meter.
	58 th	Limitations of Digital Multimeters.		
	59 th	PTM		
	60 th	REVISION		
16 th	61 st	REVISION	16.	Revision
	62 nd	3rd Sessional Test (Tentative)		
	63 rd	REVISION		
	64 th	REVISION		