

**Course Name:** Electronics Engineering Group

**Course Code:** ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI

**Subject** : Electronic Measurement and Instruments

**Semester** : Fourth

**Subject Code:** 9072

**Teaching And Examination Scheme:**

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	--	--	25@	125

**Rationale:**

This subject intends to provide the students practical information & technical background. It also provides the students with concepts, principles and procedures of Analog and Digital electronic measuring instruments and the measurement techniques for the measurement of various electronic quantities.

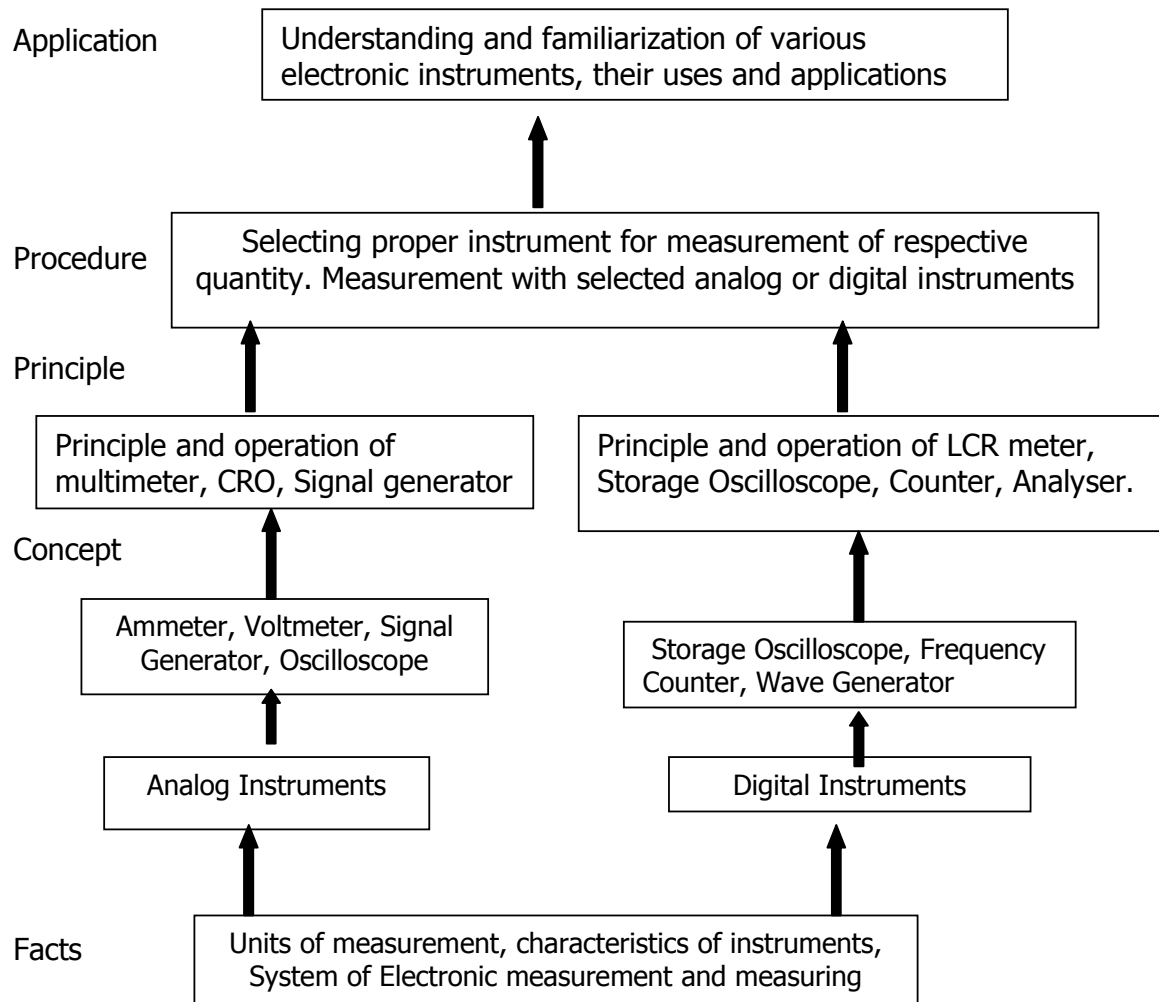
Because of the scope of the subject, students are well exposed to a good and wide area of the various electronic measuring instruments as the subject comprises of those basic equipments of which students should have knowledge.

**Objectives:**

The students will be able to:

1. Know the construction of the instruments
2. Understand the principles and operation of different measuring instruments.
3. Selecting the appropriate instrument for measurement.
4. Observing reading and interpreting the values from different meters
5. Learning the precautions& applications of the instruments
6. Reading the specifications from datasheets.

## Learning Structure:



**Content: Theory**

Chapter	Name of the Topic	Hours	Marks
01	<b>Basics of Measurement:</b>	06	10
	1.1 Classification of Instruments- Absolute Instruments, Secondary Instruments 1.2 Characteristics of Instruments 1.2.1 Static-Accuracy, Precision, sensitivity, Resolution, Static error, Reproducibility, Drift, Dead zone. 1.2.2 Dynamic- speed of response, Lag, Fidelity, Dynamic error. 1.3 Types of error- Gross, Systematic, Random. 1.4 Units of measurement fundamental. 1.5 Standards and their classification- International, Primary, Secondary, Working. 1.6 Calibration of Instruments. 1.7 Grounds- Importance of ground, Grounding, Equipment of grounding for safety.		
02	<b>Analog DC and AC Meters</b>	10	18
	2.1 Classification of Analog Instruments. 2.2 Definition of Average & RMS value. 2.3 PMMC- Working Principle, Construction, Sources of torque. 2.3.1 Analog DC Ammeters & Voltmeters. 2.3.2 Analog AC Ammeter and Voltmeter-Average Responding (Rectifier type) 2.4 Analog Multimeter- Block Diagram of Analog Multimeter and operation only. 2.5 How to use Basic meters.		
03	<b>Digital Meters</b>	12	20
	3.1 Concepts of ADC & DAC only. 3.2 Resolution, Sensitivity and Accuracy of digital display. 3.3 Digital frequency meter- Block Diagram and operation only. 3.4 Digital Voltmeter-Ramp type DVM, Integrating type DVM, Successive approximation type DVM, Dual slope type DVM. (Block diagram, Operation and waveform if required). 3.5 Digital Multimeter- Block Diagram and operation only. 3.6 LCR, Q meter- Block diagram and operation only. 3.7 Digital phase meter- Block diagram and operation only.		

04	<b>Oscilloscope</b>	12	20
	<p>Oscilloscope subsystems-</p> <p>4.1.1 Display subsystems- CRT, Deflection of electron beam in CRT, Electrostatic and Electromagnetic deflection sensitivity.</p> <p>4.1.2 Vertical deflection subsystems- Input Coupling selector, Input attenuator, Pre-amplifier, Main vertical amplifier, delay line.</p> <p>4.1.3 Horizontal deflection subsystems- Trigger circuit, Time base generator, Main Horizontal amplifier.</p> <p>4.1.4 CRO Probes- General block diagram of CRO probe, passive voltage probe, and their compensation, Active voltage probes, current probes.</p> <p>4.1.5 Calibration circuits.</p> <p>4.2 CRO-Block diagram of single beam dual trace and dual beam oscilloscope.</p> <p>4.3 Block diagram of Digital storage oscilloscope.</p> <p>Uses of CRO- Frequency and phase measurement, Tracing of diode and transistor characteristics.</p>		
05	<b>Signal Generator and Analyser</b>	08	12
	<p>5.1 Concept of oscillator.</p> <p>5.2 Signal generator-AF and RF type- Block diagram and operation only.</p> <p>5.3 Function generator and pulse generator- Block diagram, Simple controls and operation only.</p> <p>5.4 Specification.</p> <p>5.5 Concept of time domain and frequency domain instruments.</p> <p>5.6 Spectrum &amp; Logic analyzer- Block diagram and operation only.</p>		
	Total	48	80

**Practical:**

Skills to be developed:

Intellectual Skills:

1. Selection of instruments based on application
2. Selection of range of instruments
3. Interpretation of results

Motor Skills:

1. Accuracy in measurement
2. Proper Connections

**List of Practical:**

1. Compare the specifications of Analog and Digital multimeter.
2. Measure DC Voltage & DC Current using PMMC instruments.
3. Find the RMS & Average value from the measurement.
4. Measurement of R.L.C & quality factor using LCR, Q meter.
5. Measure phase using Digital phase meter.
6. Study front panel controls of specification of typical CRO.
7. Measure frequency, voltage, phase difference (by time measurement) using CRO.
8. Testing of component using CRO.
9. Using Lissagous pattern find frequency & phase difference of unknown signal.
10. Study & use of DSO.
11. Measurement of parameter of a Signal generator (Impedance, Distortion, Range).
12. Measure frequency & voltage of the different o/p waveforms of function generator.

**Learning Resources:****Books:**

Sr. No.	Author	Title	Publisher
1.	W.D. Cooper	Modern Electronic Instrumentation & Measurement Techniques	Pearson Education, New Delhi
2.	Kalsi	Electronic Instruments	Tata Mc Grow Hill
3.	A.K. Sawhney	Electrical & Electronic Measurements & Instrumentations	Dhanpat Rai & Co.
4.	Stanley Wolf & Richard Smith	Student Reference Manual for Electronic Instrumentation laboratory.	Prentice Hall