

Course Name : Electronics Engineering Group.

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

Semester : Third

Subject Title : Electronics Instruments and Measurements

Subject Code : 17317

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	25 #	--	25@	150

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

Instrumentation is an emerging field used in data detection, acquisition, analysis and control in industrial applications. Analog and digital instruments are mainly used to determine different process parameters. These instruments present the desired information in visual indication either in analog or digital form.

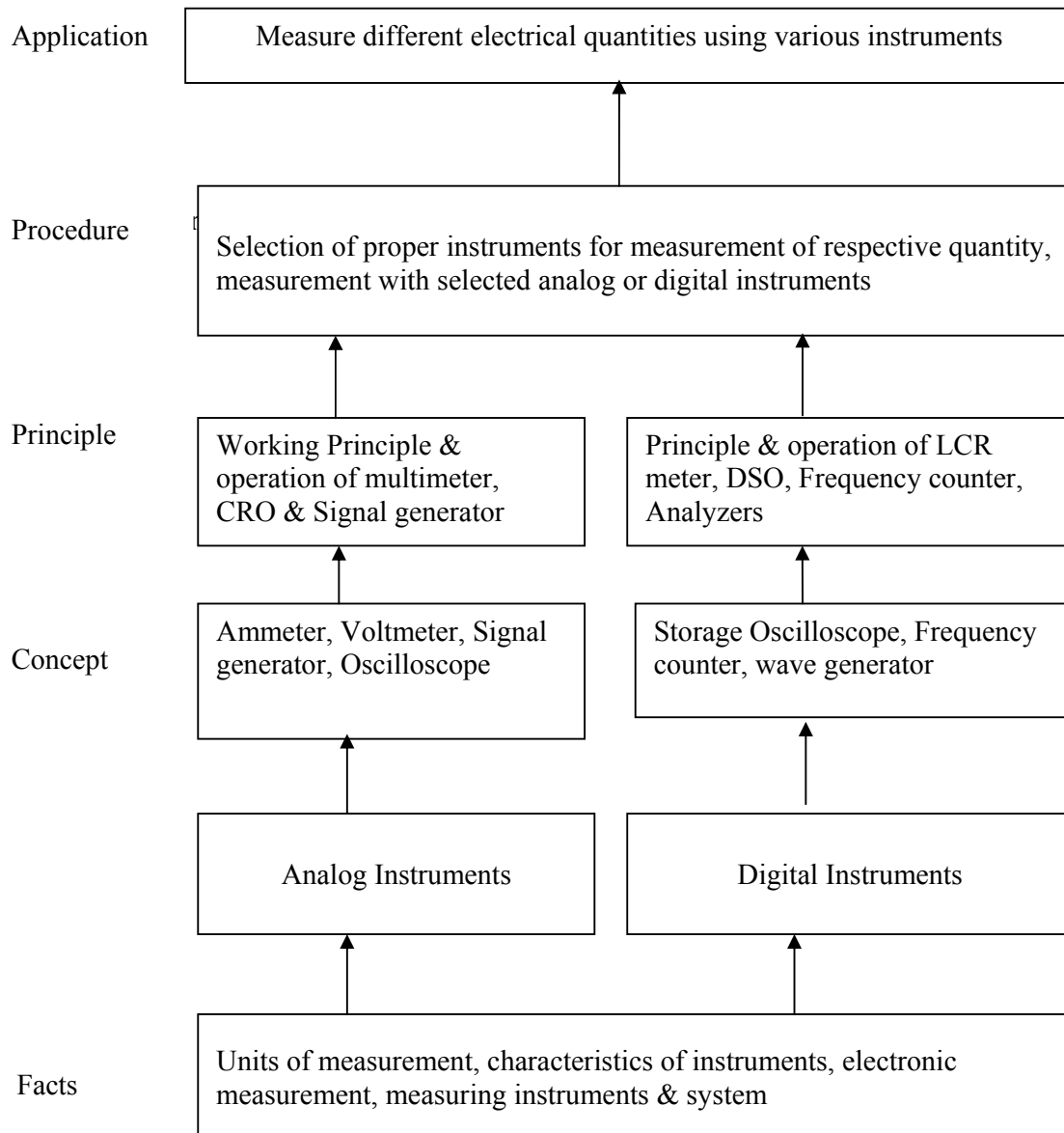
This subject presumes that the students are familiar with basic utilization of measuring instruments. The era of this subject consists of the information about concepts, principles and procedures of analog and digital electronic measuring instruments and measuring techniques.

General Objectives:

The Students will be able to:

1. Understand the principle & operation of different measuring instruments.
2. Select the instrument for the measurement of specific electrical parameter.
3. Understand the procedure for fault finding in electronic systems.

Learning Structure:



Theory:

Topics and Contents	Hours	Marks
<p>Topic 1: Basics of Measurement:</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Define measurement and instrument. ➤ Classify various instruments. <p>Contents</p> <ul style="list-style-type: none"> • Classification of Instruments: Absolute , Secondary Instruments • Definitions of Static characteristics of Instruments: Accuracy, Precision, Sensitivity, Resolution, Static error, Reproducibility, Drift, Dead Zone • Definitions of dynamic characteristics of Instruments: Speed of response, Lag, fidelity, Dynamic error • Types of Errors- Gross, Systemic, Random • Units of measurement of fundamental quantity • Definition of Standards and their classification: <ul style="list-style-type: none"> International Primary Secondary • Calibration: Definition, Need of calibration 	06	12
<p>Topic 2: Analog DC and AC Meters</p> <ul style="list-style-type: none"> ➤ Draw the constructional diagram of PMMC meter. ➤ State the working principles of different types of DC/AC Voltmeter/ Ammeter and list their specifications. ➤ Describe the working of analog multimeter <p>Contents</p> <ul style="list-style-type: none"> • Classification of analog ammeter and voltmeter • Working principle and construction of PMMC instruments • Analog DC Ammeter: Shunt resistor type, Ayrton Shunt type • Analog DC Voltmeter: Multiplier voltmeter • Derivations of deflecting torque of PMMC instruments • Derivation for calculation of shunt and series resistance • Multirange voltmeter: Voltmeter sensitivity, loading effect. • Analog AC Voltmeter (No derivation)- Half Wave rectifier type, Full wave rectifier type, Multirange type • Analog AC Ammeter • Analog multimeter: Electrical circuit diagram, operation 	10	24
<p>Topic 3: Digital Meters:</p> <ul style="list-style-type: none"> ➤ Draw block diagram and describe operation of different digital meters. ➤ State the applications of digital meters <p>Contents</p> <ul style="list-style-type: none"> • Concepts of ADC & DAC (Review) (No marks) • Advantages and Disadvantages of Digital Instruments and comparison with analog instruments • Block diagram, operation and applications of <ul style="list-style-type: none"> Digital Frequency meter Digital Voltmeter DMM 	12	20

LCR –Q meter			
<p>Topic 4 : Oscilloscope:</p> <ul style="list-style-type: none"> ➤ Draw the basic block diagram and describe the function of each block of CRO. ➤ List and describe different applications of CRO. ➤ Draw the basic block diagram and describe the function of each block of DSO. <p>Contents</p> <ul style="list-style-type: none"> • CRO: Basic Block diagram and function of each block • CRT: Construction and working • Vertical Deflection System –Block diagram and operation • Horizontal deflection system – Block diagram and operation • Function of delay line • Explanation of waveform generation • Applications of CRO: <ul style="list-style-type: none"> Time & frequency measurement Voltage measurement Lissagous patterns for Phase and Frequency measurement • Concept, block diagram and Operation of: Single beam dual trace & Dual beam Dual Trace CRO • Block diagram, operation and applications of digital storage oscilloscope (DSO) 		12	24
<p>Topic 5: Signal generator and Wave Analyzer:</p> <ul style="list-style-type: none"> ➤ Draw block diagram of signal generator and waveform analyzer and their working ➤ Procedural steps for fault finding and removing in T.V. using pattern generator. ➤ Draw block diagram of harmonic distortion analyzer and describe its working. <p>Contents</p> <p>5.1 Signal generators: 10 Marks</p> <ul style="list-style-type: none"> • Definition and need of signal generator • Block diagram, operation and applications of : <ul style="list-style-type: none"> AF and RF type signal generator Function generator Square and Pulse generator Video pattern generator <p>5.2 Wave analyzers: 10 Marks</p> <ul style="list-style-type: none"> • Definition and need of waveform analyzer • Block diagram, operation and applications of : <ul style="list-style-type: none"> Frequency selective wave analyzer Distortion factor meter Logic analyzer Spectrum analyzer 		08	20
Total		48	100

Practical:**Skills to be developed:****Intellectual Skills:**

- Selection of instruments based on applications
- Interpretation of results.

Motor Skills:

- Selection of proper instrument with respect to parameter and range
- Proper connections and interfacing
- Testing of basic electronic circuits using these instruments

List of Practicals:

(Attach a separate sheet in the Manual covering the specifications of instrument/ equipment studied)

1. Draw the block diagram of Function generator. Identify the blocks from circuit. Test and verify function outputs as per specifications.
2. Draw and label the front panel controls of Dual trace CRO. Measure frequency, voltage, phase difference, rise and fall time using CRO.
3. Measure frequency and phase difference of unknown signals with the help of Lissagous pattern by using CRO. Test different components and semiconductor devices using CRO.
4. Prepare the fault finding flow chart for Power supply, identify the major components/sections, trace circuit, Measure voltages.
5. Draw the layout of any one section of CRO trainer, check for Continuity and Fault finding.
6. Observe and draw the front panel controls of Digital Storage Oscilloscope and test and verify functionality of controls.
7. Draw different output patterns obtained from Pattern generator and use of these patterns to test the performance of different sections of T.V.
8. Draw front panel of Logic Analyzer and write functions of each.
9. Draw the front panel of Spectrum Analyzer and write functions of each
10. Draw layout of PA system and identify different connectors /sockets on front and rear panel, connect input and output devices and test PA system.

Learning Resources:**User's manuals of various instruments****1. Books:**

Sr. No.	Author	Title	Publisher
01	A. D. Helfrick W. D. Cooper	Modern Electronic Instrumentation & Measurement Techniques	PHI Learning Pvt. Ltd. New Delhi.
02	Kalsi H.S.	Electronic Instrumentation	Tata McGraw Hill
03	A.K Sawhney	Electrical & Electronic Measurements & Instrumentation	Dhanpat Rai & Sons
04	S K Singh	Industrial Instrumentation and Control	Tata McGraw Hill Education Private Limited, New Delhi

2. CD/ PPTs Etc:

- www.proprofs.com/webschool
- www.osvn.com

3. Websites

- <http://en.wikipedia.org/wiki/>
- www.youtube.com/ “here type name of instrument”
- www.controlnet.com