Teacher/Instructor: Dr.K.Prasanthi Jasmine
Department of Electronics and Communication Engineering
Professor of ECE

Lesson Plan for a Day Term
Semester /Year:Sem-II-Syllabus2020-21

MICROLESSON PLAN

(ACCORDING TO BLOOMS DIGITAL TAXONOMY)

Programme	B.Tech, Electronics & Communication Engineering
Semester	IVYear-II Semester
Subject Title	Electronics Measurements and Instrumentation
Subject Code	R1641042
Class Hours	6-Hours per week
Total Hours	70
Credits	3
Max Marks	100
Unit& Title	Unit-I: INTRODUCTION TO DIFFERENT INSTRUMENTS
Teaching and Learning	Black Board/Power Point Presentation/Videos, E-material.

Detailed – Lesson 1 INTRODUCTION Lesson Objectives:	
Factual	Students will be able to understand different performance parameters and operation of ac , dc meters in measuring instruments.
Conceptual	Students will be able to understand the operation of different wave generator circuits , wave analyzers and CROs.
Procedural	Students will be able to design different bridge circuits and transducers along with their applications
Applied	Students should be able to measure different parameters like pressure, temperature, displacement, flow, speed, moisture and DAS.

Pre Requisite Knowledge:

Knowledge of

Electronics Devices and Circuits,

Pulse and Digital Circuits

Micro Lesson Plan: Day-1.

Understanding and analyzing an instrument can be easily identified by means of its internal components basically the discrete components.For any instrument a basic meter is required.It is a DC meter. Connecting multiplier resistors makes an DC instrument and a rectifier makes an AC instrument. The performance characteristics of an instrument justifies the working condition of the instrument.

Pre-task Activity- Performance Characteristics of Instrument

The study of any instrument is by means of its characteristics specifically static and dynamic characteristics. This will help in understanding the concepts of various basic instruments **like DC voltmeters. AC voltmeters, Ammeters, Ohmmeters and Multimeters.**

Video Link: https://www.youtube.com/watch?v=ReogUmgUwSo

1. In-class Activity:

PART-1- Characteristics of Instruments	
S.No	Name of the Topic
1	Static characteristics: ➢ Accuracy, ➢ Resolution ➢ Precision ➢ Expected Value ➢ Error ➢ Sensitivity
2	Dynamic characteristics: ➢ Speed of response, ➢ Fidelity, ➢ Lag, ➢ Dynamic error
3	Errors in Measurement: ➢ Absolute Error ➢ Percentage of Error
4	Types of Errors: ➢ Gross errors ➢ Systematic errors ➢ Random Errors

Need of Measurements & Instrumentation

- **Measurement** of quantities may be done to **measure** parameters of a system. Using transducers, physical properties such as temperature, pressure, flow, force, and many others can be converted into **electrical** signals, which can then be conveniently **measured** and recorded.
- **Instrumentation** is a technology of measurement which serves not only science but all branches of engineering, medicine, and almost every human needy.
- ***The knowledge of any parameter largely depends on the measurement.***

Accuracy is expressed as % accuracy

$$a = 100\% - \%error$$

where 'a' is the % of accuracy.

$$a = AX100\%$$

$$\%\,Error = \frac{Absolute\,Value}{Expected\,Value}\,X\,100 = \frac{e}{Y_n}\,X\,100$$

$$\%\,Error = \left(\frac{Y_n - X_n}{Y_n}\right)X\,100$$

It is more frequently expressed as a "Accuracy" rather than error.

$$A = 1 - \left|\frac{Y_n - X_n}{Y_n}\right|$$

where 'A' is the *relative accuracy*.

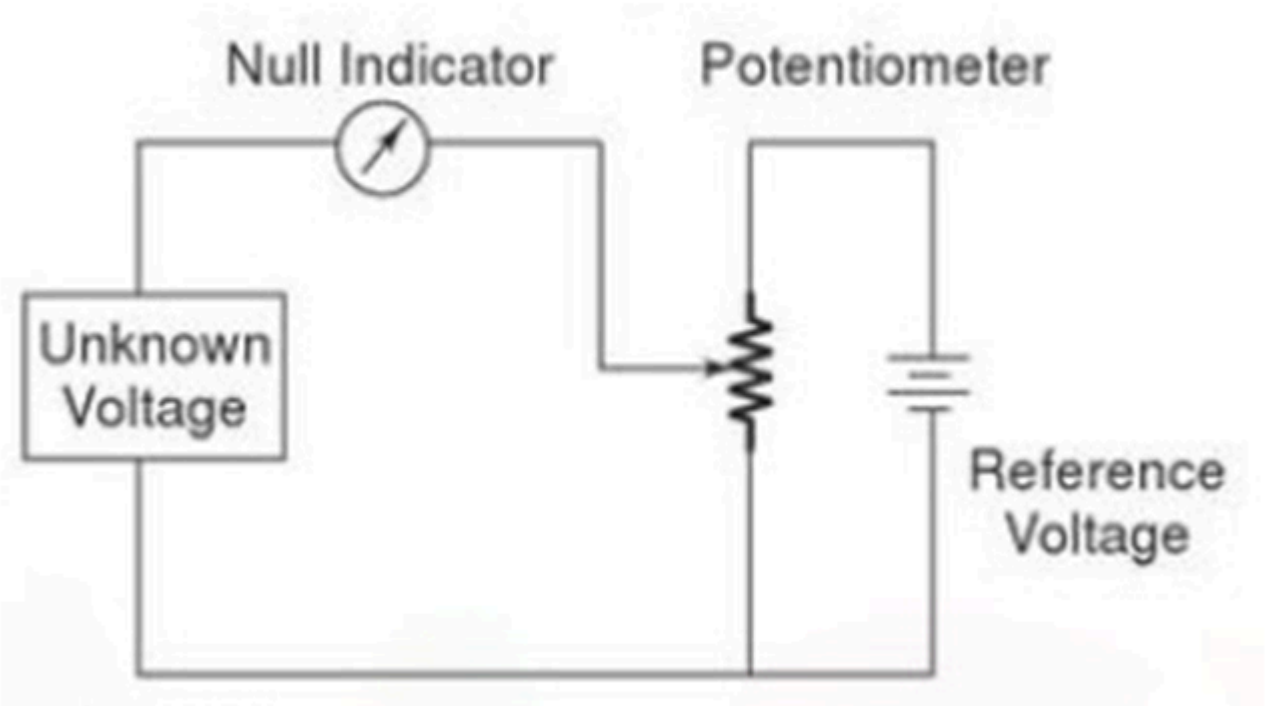
Basic meter used as a dc voltmeter:

To use the basic meter as a de voltmeter, it is necessary to know the amount of current required to deflect the basic meter to full scale. This current is known as full scale deflection current I(fsd). For example, suppose a 50 μA current is required for full scale deflection. This full scale value will produce a voltmeter with a sensitivity of20,000 Ω per V. The sensitivity is based on the fact that the full scale current of 50 μA results whenever 20,000 Ω of resistance is present in the meter circuit for each voltage applied.

$$\text{Sensitivity} = 1/I_{fsd} = 1/50\ \mu A = 20\ k\Omega/V$$

Hence, a 0 - 1 mA would have a sensitivity of 1 V/1 mA = 1 kΩ/V or 1000 Ω.

Construction and working of Solid State Basic Differential Voltmeter



Working of multi range voltmeter:

A dc voltmeter can be converted into a multi range voltmeter by connecting a number of resistors (multipliers) along with a range switch to provide a greater number of workable ranges.

Figure -1 shows a multi range voltmeter using a three position switch and three multipliers R1, R2, and R3 for voltage values

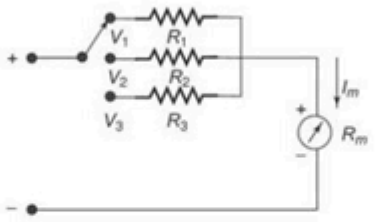


Figure -1: Multi range voltmeter

Figure -1 can be further modified to Figure-2, which is a more practical arrangement of the multiplier resistors of a multi range voltmeter.

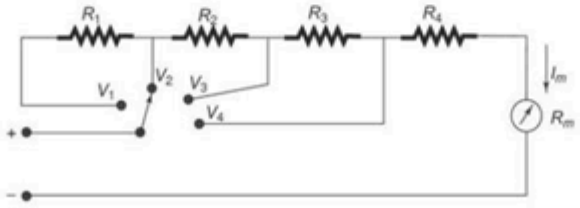
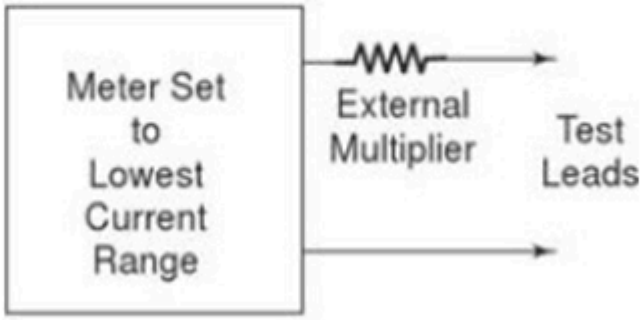


Figure-2: Multipliers connected in series string

Process of Extending range of a voltmeter :

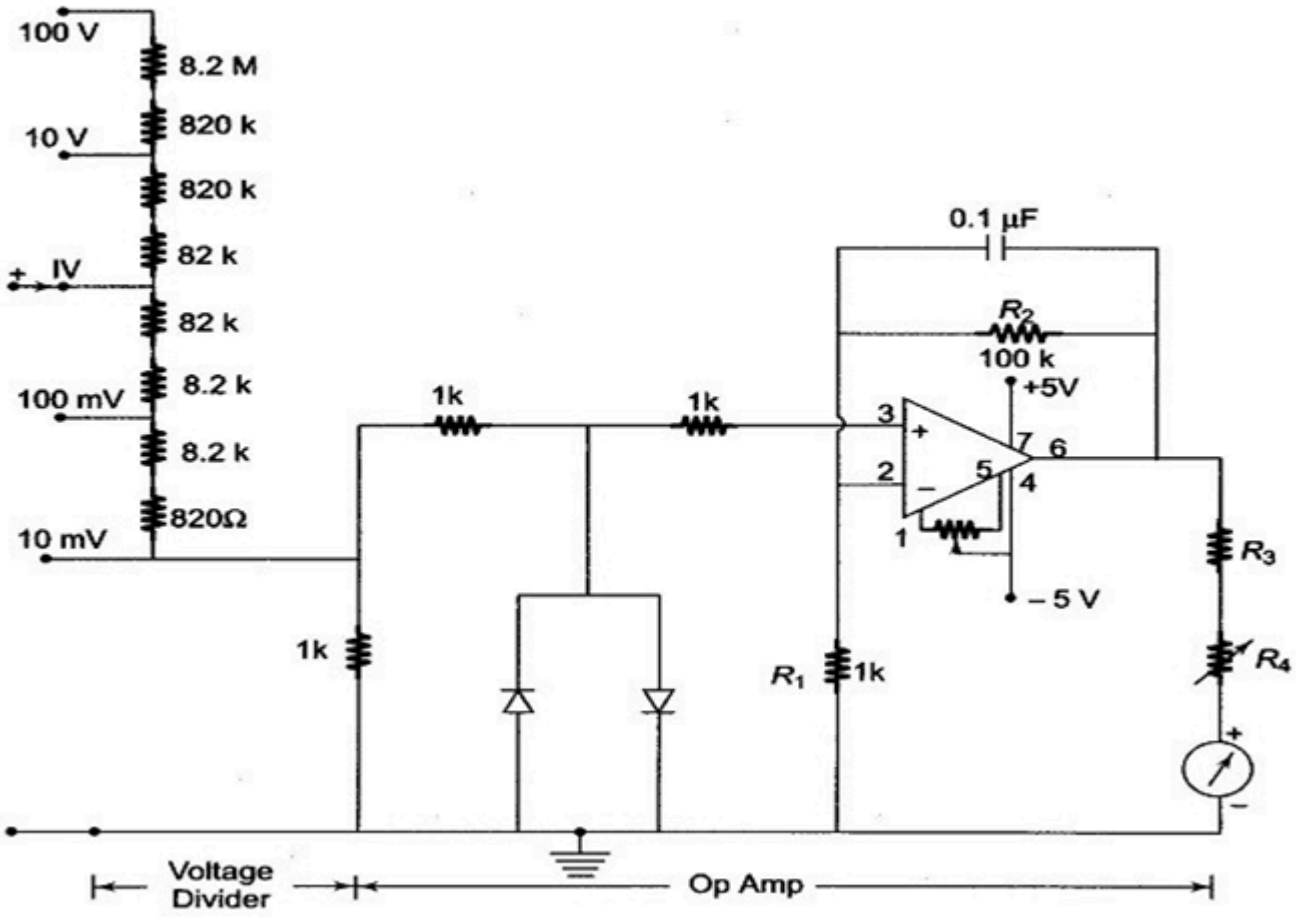
The range of a voltmeter can be extended to measure high voltages, by using a high voltage probe or by using an external multiplier resistor, as shown in Figure below



Extending voltage range

Construction and working of Solid State Voltmeter

SOLID STATE VOLTMETER



2. Post–task Activity:

1. The closeness of values indicated by an instrument to the actual value is defined as
   a) repeatability b) reliability c) uncertainity d) accuracy [d]

2. Precision is defined as
   a) repeatability b) reliability c) uncertainity d) accuracy [a]

3. The ratio of change in output to the change in input is called
   a) repeatability b) resolution c) sensitivity d) accuracy [c]

4. The difference between the expected value of the variable and the measured variable is termed
   a) random error b) absolute error c) gross error d) instrument error [b]

5. Accuracy is expressed as
   a) relative accuracy b) % accuracy
   c) relative error d) % error [a]

Andhra Loyola Institute of Engineering and Technology Online Test-1

Electronic Measurements and Instrumentation IV ECE

1.The closeness of values indicated by an instrument to the actual value is defined as

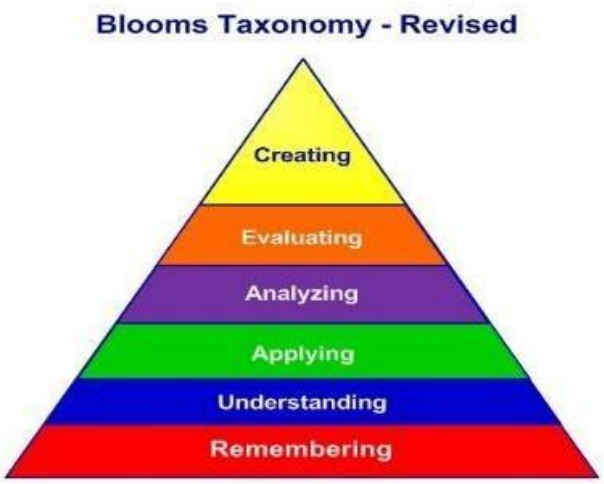
- repeatability
- reliability
- uncertainity
- accuracy

1. Discussion

- Students will be able to learn the different performance characteristics of instruments along with different types of errors like gross errors, instrumental errors and random errors related to any instrument.
- Students will be able to learn the design of different DC voltmeters, AC voltmeters, Ammeters , Ohmmeters (both series and shunt) as well as multimeter along with its applications.

2. References

1. Electronic Instrumentation by H S Kalsi ,Tata Mc Graw Hill Publishers, 3rd Edition
2. Modern Electronic Instrumentation and Measurement Techniques by Albert.D. Helfrick & Willam D. Cooper [PHI]
3.Electronic Instrumentation and Measurements by David A. Bell Oxford University Press, 2nd Edition
4.Electronic Meeasurements& Instrumentations by K. Lal Kishore Pearson Education 2005



Taxonomy of Objectives –Specific Objectives

Knowledge Dimension	The Cognitive Process Dimension					
	Remember	Understand	Apply	Analyze	Evaluate	Create
A.Factual Knowledge	SO-1,2	SO,-1,2,3	SO-1,2,3			
B. Conceptual Knowledge	SO-1,2	SO-1,2,3	SO-1,2,3			
C. Procedural Knowledge	SO,-1,2	SO-1,2,3	SO-1,2,3			
D.Meta Cognitive Knowledge						