

**III Year II Semester**

**Code: 20EC6317**

**L T P C**

**3 0 0 3**

**ELECTRONIC MEASUREMENTS & INSTRUMENTATION**

**Course Objectives:**

1. To learn and understand characteristics of various measuring instruments.
2. To understand the basic principles of electronic instruments viz. signal generators and signal analyzers.
3. To acquire knowledge of oscilloscopes and their applications.
4. To compare various measuring bridges and their balancing conditions.
5. To understand the methods for measurement of physical parameters using transducers.

**UNIT-I: Performance characteristics of instruments, Static characteristics:**

Accuracy, Resolution, Precision, expected value, Error, Sensitivity. Dynamic Characteristics; speed of response, Fidelity, Lag and Dynamic error. Types of errors in measurements and their analysis. Design of multi-range AC, DC meters (voltmeter & ammeter) and ohmmeter (series & shunt type) using D'Arsonval movement.

**UNIT-II: Specifications and designing aspects of Signal Generators:**

AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

**UNIT-III: Oscilloscopes:**

General purpose CROs; block diagram, functions and implementation of various blocks, specifications, various controls and their functions, types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns. Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope

**UNIT-IV: Bridge circuits:**

Wheat stone bridge, measurement of very low resistance, Measurement of inductance-Maxwell's bridge, Anderson bridge. Measurement of capacitance-Schering Bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter; principle of operation. Counters: principle of operation -modes of operation

**UNIT-V: Transducers:**

Active & Passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers. Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement.

**Course Outcomes:**

A student who successfully fulfils this course requirement will be able to:

S. No	Course Outcome	BTL
1.	Understand the performance characteristics of instruments.	L2
2.	Understand different signal generators and analyzers.	L2
3.	Understand the design of oscilloscopes for different applications.	L2
4.	Understand and analyze the different types of DC and AC bridges for impedance measurements.	L4
5.	Apply the knowledge of different transducers for measurement of different parameters.	L3

**Correlation of COs with POs & PSOs:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	1	-	-	-	-	-	-	-	-	-	3	-
CO 2	3	2	1	-	-	-	-	-	-	-	-	-	3	-
CO 3	2	1	1	-	-	-	-	-	-	-	-	-	2	-
CO 4	3	3	1	-	-	-	-	-	-	-	-	-	2	-
CO 5	2	1	1	-	-	-	-	-	-	-	-	-	3	-

**Text Books:**

1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrich and W.D. Cooper, PHI, 5<sup>th</sup> Edition, 2002.

**Reference Books:**

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 3<sup>rd</sup> Edition, 2013.
2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. Dhanpat Rai & Co, 12<sup>th</sup> Edition, 2002.