

EC3112PE: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE – I)

B. Tech. III Year I Sem.	L	T	P	C
Prerequisite: Basic Electrical and Electronics Engineering	3	0	0	3

It provides an understanding of various measuring system functioning and metrics for performance analysis.

Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.

Understanding the concepts of various measuring bridges and their balancing conditions.

Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes: Upon completing this course, the student will be able to
 Measure electrical parameters with different meters and understand the basic definition of measuring parameters.
 Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
 Operate an Oscilloscope to measure various signals.
 Measure various physical parameters by appropriately selecting the transducers.

UNIT - I:

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D'Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT - II:

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT III:

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT IV:

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

UNIT V:

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

TEXT BOOKS:

Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbins, W. D. Cooper: PHI 5th Edition 2003.

Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

REFERENCE BOOKS:

Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, Dhanpat Rai & Sons, 2013.

Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.

Industrial Instrumentation: T.R. Padmanabham Springer 2009.

Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.