

4/4 B.Tech - EIGHTH SEMESTER

EC8T2

Electronic Measurements and Instrumentation

Credits: 3

Lecture: 3 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Prerequisites: Electronic Devices and Circuits (EC2T5)
Network Analysis and Synthesis (EC3T4)

Course Objectives:

- To study the performance characteristics of various electronic measuring instruments.
- To learn the principles of working of various signal generators and wave analysers .
- To understand the working principle of CRO, specifications, applications and study the working of various advanced CRO's and their applications.
- To understand the working principle of Q-Meters, various AC bridges and their applications.
- To learn the principles of operation of various active and passive transducers and data acquisition systems.

Learning Outcomes:

Student will be able to

- Make use of signal generators, wave analyzers, oscilloscopes, and bridges for suitable measuring applications.
- Identify the use of active & passive transducers for measuring physical parameters.
- Analyze the principles of data acquisition systems.

UNIT- I

Performance characteristics of instruments: Static characteristics, Errors in Measurement, Dynamic Characteristics, DC Voltmeters- Multi range, Range extension, AC voltmeters- multi range, Range Extension, Thermo couple type RF ammeter, Ohmmeters series type, shunt type, Millimeteres for Voltage, Current and resistance measurements.

UNIT- II

Signal Generator& Wave Analyzers : Fixed and variable signal generators, AF oscillators, Standard signal generator, AF sine and square wave signal generators, Function Generators, Square & pulse generator, sweep generator. Basic wave analyzers, Frequency selective wave analyzers, Hetero- dyne wave analyzer, Harmonic Distortion Analyzers, Spectrum Analyzers.

UNIT- III

Oscilloscopes: Basic block diagram, CRT features, vertical amplifiers, horizontal deflection system, triggered sweep CRO, delay line , Dual beam CRO, Dual trace oscilloscope,

Measurement of amplitude, period and frequency, Lissajous method of frequency measurement.

Sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, probes for CRO- Active & Passive, Frequency counter, Time and Period measurement.

UNIT- VI

Bridges: Wheatstone Bridge, AC Bridges Measurement of inductance- Maxwell's bridge, Measurement of capacitance - Schering Bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter, Errors in Q meter.

UNIT- V

Transducers- Resistance, Capacitance, inductance, Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors, force, pressure, velocity, humidity, moisture, speed, proximity & displacement, Data acquisition system.

Learning Resources

Text Books:

1. Electronic instrumentation, - H.S.Kalsi, Tata McGraw Hill, 2nd edition 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

References:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A. Twitter, Pearson Education, 2nd Edition, 2004.