

4/4 B.Tech - EIGHTH SEMESTER

EC8T2

Electronic Measurements and Instrumentation

Credits: 4

Lecture : 4 periods/week

Tutorial: 1 period /week

Internal assessment: 30 marks

Semester end examination: 70 marks -----

Course Objectives:

- To study performance characteristics of various electronic measuring instruments in detail.
- To study the principles of working of various signal generators and wave analysers in detail.
- To study the principle of working of CRO , is specifications , applications in detail and study the working of various advanced CRO's and their applications.
- To study the principle of working of Q-Meters various AC bridges and their applications.
- To study the principles of operation of various active and passive transducers and their views to measure various physical parameters using electronic measuring instruments and data acquisition systems.

Learning Outcomes:

- Students will be able to select & use the electronic instruments like signal generators, wave analyzers, various oscilloscopes, various types of bridges by knowing their specifications for electronic measurements.
- Students will be able to select & use various active & passive transducers for measuring various physical parameters.
- Students are aware of the principles of working 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, Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multimeters for Voltage, Current and resistance measurements.

UNIT- II

Signal Generator: Fixed and variable signal generators, AF oscillators, Standard signal generator, AF sine and square wave signal generators, Function Generators, Square & pulse generator, sweep generator.

UNIT -III

Wave Analyzers: Basic wave analyzers, Frequency selective wave analyzers, Hetero- dyne wave analyzer, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT- IV

Oscilloscopes: Basic block diagram, CRT features, simple CRO, 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.

UNIT- V

Special Oscilloscopes: 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- VII

Transducers- Resistance, Capacitance, inductance, Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors

UNIT- VIII

Measurement of physical parameters: force, pressure, velocity, humidity, moisture, speed, proximity & displacement, Data acquisition system

Learning Resources

Textbooks:

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, 2rd Edition, 2004.