204186   Electronic Measuring Instruments and Tools

Teaching Scheme: **Examination Scheme:**

Lectures: 1 Hr/ Week   **Term work :** 50 Marks

Practical: 2 Hrs/Week

Course Objectives and Outcomes:

Many advanced electronic measuring instruments are being innovated and introduced in the market. It is essential for an electronics engineer to know the functions, specifications and make the measurements on many of the instruments. The main objective of this course is to introduce and expose the students to various measuring instrument, their block diagram, specifications and applications.

Having successfully completed this course, the student will be able to:

1. Understand fundamental of measurements of various electrical parameters.
2. Aware and identify the control panels of measuring and generating instruments.
3. Understand and describe specifications, features and capabilities of electronic instruments.
4. Select appropriate instrument for the measurement of electrical parameter professionally.
5. Finalize the specifications of instrument and select an appropriate instrument for given measurement.
6. Make the required measurement using various instruments.

Following list of experiments is broad based on block diagram, specifications, features, various measurement capabilities and applications of various essential instruments that are being used in E & T/C engineering professionally. It is expected that teaching faculty will explore these instruments in detail in respective laboratory sessions. Prominent specifications of the instrument should be listed and attached in file/journal.

List of Practicals   (Any Ten)

1. Carry out Statistical Analysis of Digital Voltmeter

   - Calculate mean, standard deviation, average deviation, and variance.
   - Calculate probable error.

- Plot Gaussian curve.

2. Perform following using Multimeter

   - Measurement of dc voltage, dc current, ac (rms) voltage, ac (rms) current, resistance and capacitance. Understand the effect of decimal point on resolution. Comment on bandwidth.

   - To test continuity, PN junction and transistor.

3. Perform following using CRO

   - Observe alternate, chop modes.

   - Measure unknown frequency and phase using XY mode.

   - Perform locking of input signal using auto, normal, external, rising and falling edge trigger modes.

   - Verify calibration, level, astigmatism, ac, dc, ground, attenuator probe operations.

4. Perform following using DSO

   Perform Roll, Average, Peak detection operations on signal

   - Capture transients

   - Perform FFT analysis of sine and square signals

   - Perform various math operations like addition, subtraction and multiplication of two waves.

5. Study of True RMS meter

   Measure RMS, peak, average voltages for half controlled rectifier or Full controlled   rectifier by varying firing angle.

6. Study of programmable LCR meter

   - Measure L, C & R

   - Measure Q and Dissipation factor.

7. Study of Spectrum Analyzer

   - Perform harmonic analysis and Total Harmonic Distortion (THD) measurement for sine and square waves.

   - Verify frequency response of filters & high frequency (HF) amplifier.

   - Analyze Spectrum of AM & FM and to measure percent modulation and bandwidth.

8. Study of Frequency Counter

   - Carry out measurements through different modes of measurement.

   - Measure frequency, time, ratio, events & pulse width.

9. Calibration of Digital Voltmeter (DVM)

   Calibrate DVM for dc voltage, ac voltage and dc current.

10. Study function generator/Arbitrary waveform generator

    - Generate signal of required amplitude, frequency, duty cycle, offset etc.

    - Generate special signals such as noise, ECG, sweep, burst, AM, FM, PM etc.