

MMPC3002 INTRODUCTION TO INSTRUMENTATION ENGINEERING (3-0-0)

Course Objectives:

1. This course enables the students to help students grasp how to use instruments for electronic measurement.
2. This course enables the students to be knowledgeable about CRO and various Function Generator circuit.
3. This course enables the students to be familiar with Frequency Counter design and usage.
4. This course enables the students to understand Data Acquiring Systems and Interfacing.

Module-I: (08 hrs)

Basics of Measurements: Accuracy, Precision, resolution, reliability, repeatability, validity, Errors and their analysis, Standards of measurement. Bridge Measurement: DC bridges- wheat stone bridge, AC bridges – Kelvin, Hay, Maxwell, Schering and Wien bridges, Wagner ground Connection. Electronic Instruments for Measuring Basic Parameters: Amplified DC meter, AC Voltmeter, True- RMS responding Voltmeter, Electronic multi-meter, Digital voltmeter, Vector Voltmeter.

Module-II: (05hrs)

Cathode Ray Oscilloscope: Block diagram of CRO, cathode ray tube, Deflection amplifier, Vertical deflection system, horizontal deflection systems, Oscilloscope probes, Measurements with CRO- voltage, frequency and phase measurements, Digital storage Oscilloscope.

Module-III: (05 hrs)

Signal Generator: Sine-wave generator, pulse and square wave generator, Triangular wave generator, Frequency synthesized signal generator, Frequency divider generator, Function generators.

Module-IV: (06 hrs)

Frequency And Time Interval Measurement: Simple frequency counter, extending frequency range of counter, Automatic computing counter, Phase detector, Spectrum analyzer, Network analyzer.

Module-V (06 hrs)

Analog And Digital Data Acquisition Systems: Introduction, Signal conditioning of input, Single channel and multi-channel data acquisition systems, Data conversion, ADC, DAC, IEEE-488 GPIB Bus.

Course Outcomes:

After the completion of this course, graduate students will be able to:

- CO1: Understand the significance of instrument specification.
- CO2: Become familiar with the CRO measurement instrument's design, operation, and usage.
- CO3: Investigate various methods for standard signal generation.
- CO4: Examine the different frequency measurement tools.
- CO5: Understand the hardware needed for data acquisition systems.

Essential Reading

1. D. A. Bell, Electronic Instrumentation and Measurement, PHI
2. H. S. Kalsi, Electronic Instrumentation, TMH
3. A. K. Sawhney, Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai , 2003

Supplementary Reading

1. A. D. Helfrick, W. D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI
2. D. Patranabis, Principles of Electronic Instrumentation, PHI
3. J. P. Bentley, , Principles of Measurement Systems, Longman Group Ltd. (Pearson Education) , 1995