

<b>5<sup>th</sup> Semester</b>	<b>REC5D005</b>	<b>Electronics Instrumentation &amp; Measurements</b>	<b>L-T-P 3-0-0</b>	<b>3Credits</b>
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**Module-I** (12 Hours)

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** (12 Hours)

Oscilloscopes: Cathode Ray Tube, Vertical and Horizontal Deflection Systems, Delay lines, Probes and Transducers, Specification of an Oscilloscope. Oscilloscope measurement Techniques, Special Oscilloscopes – Storage Oscilloscope, Sampling Oscilloscope, Signal Generators: Sine wave generator, Frequency – Synthesized Signal Generator, Sweep frequency Generator. Pulse and square wave generators. Function Generators.

**Module-III** (10 Hours)

Signal Analysis: Wave Analyzer, Spectrum Analyzer. Frequency Counters: Simple Frequency Counter; Measurement errors; extending frequency range of counters Transducers: Types, Strain Gages, Displacement Transducers.

**Module-IV** (6 Hours)

Digital Data Acquisition System: Interfacing transducers to Electronics Control and Measuring System. Instrumentation Amplifier, Isolation Amplifier. An Introduction to Computer-Controlled Test Systems.IEEE-488 GPIB Bus

**Books:**

- [1]. Modern Electronics Instrumentation & Measurement Techniques, by Albert D.Helstrick and William D.Cooper, Pearson Education.
- [2]. Elements of Electronics Instrumentation and Measurement-3rd Edition by Joshph J. Carr. Pearson Education.
- [3]. Electronics Instruments and Instrumentation Technology – Anand, PHI
- [4] Doebelin, E.O., Measurement systems, McGraw Hill, Fourth edition, Singapore, 1990.
- [5] A Course in Electrical and Electronic Measurements and Instrumentation, A K Sawhney, Puneet Swhney, Dhanpat Rai & Co

**Digital Learning Resources:**

Course Name: Electrical Measurement and Electronics Instrument  
 Course Link: <https://nptel.ac.in/courses/108/105/108105153>  
 Course Instructor: Prof. Avisek Chatterjee, IIT, Kharagpur