

Nirma University
School of Technology, Institute of Technology
Instrumentation & Control Engineering

B. TECH. SEMESTER –IV

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Course Code 2IC403

Course Title **Electrical and Electronics Measurement**

Course Learning Outcome:

At the end of the course, students will be able to -

- elaborate the concepts of different electrical and electronics measurements
- elaborate testing and measuring instruments for various applications
- analyze and develop various ac and dc bridge circuits

Syllabus

**Teaching
Hours**

UNIT 1: Introduction:

Types of instruments: Indicating, recording, integrating etc., Instruments characteristics, Errors in measurements, Statistical evaluation of measurement data and errors, the decibel, problems.

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UNIT 2: Analog DC and AC meters:

Electromechanically meter movements, Analog DC ammeters, Analog DC voltmeters, Analog AC ammeters and Voltmeters, Analog multi-meters, Special purpose analog meters, Use of basic meters, meter errors, problems.

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UNIT 3: Digital Meters:

Various types of DVMS, digital multi-meters.

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UNIT 4 : Oscilloscope:

Oscilloscope subsystem, Display subsystem, Vertical deflection subsystem, Dual trace feature, Horizontal deflection subsystems, oscilloscope probes, oscilloscope controls, Front panel of an oscilloscope, oscilloscope photography, Digital storage oscilloscope, Power scope.

10

UNIT 5: Time & Frequency Measurement:

Time Measurements, Frequency measurement, Harmonic Analysis and spectrum analyzers, problems.

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UNIT 6: Power & Energy Measurement:

Power in AC circuits, single-phase power measurements, Poly-phase power and

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measurements, Electrical energy measurements, Power measurements problems.

UNIT 7: Resistance and Measurement of Resistance:

Resistance and resistor, resistor type, color coding of resistor, measurement of resistance, Wheatstone Bridge, Making balanced Wheatstone Bridge measurement, Low value resistance measurement, problems. 4

UNIT 8: Measurement of Capacitance, Inductance, and Impedance:

Capacitance and capacitors, capacitor circuit models and losses, capacitor types, color coding of capacitor, Inductor and Inductance, Inductor structure, Transformers, Impedance, Capacitance and Inductance, Capacitance and Inductance measurement, complete impedance measurement, problems. 8

UNIT 9: A.C. Signal Sources:

Sweep Frequency generators, Pulse generators, Function generators, Oscillators. 4

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

- (1) Student reference manual for Electronic and Instrumentation measurement, Wolf & Smith, PHI Publication.
- (2) Electronic Instrumentation and Measurement, David A. Bell, Oxford Publication
- (3) Electronic Instrumentation, H S Kalsi, Tata-McGraw Hill Publication
- (4) Modern Electronic Instrumentation and Measurement Techniques, A. D. Helfrick and W. D. Cooper, PHI Publication
- (5) A course in Electrical and Electronics Measurement and Instrumentation, A. K. Sawhney, Dhanpat Rai Publication