



IV Year-I Semester		L	T	P	C
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INSTRUMENTATION (R164102D)					

Prerequisite Course:

Electrical Measurements

Course Description and Objectives:

This course introduces the principle of operation of basic analog and digital measuring instruments for measurement of current, voltage, power, energy, etc. Measurement of resistance, inductance and capacitance by using bridge circuits

Course Outcomes:

Upon completion of the course ,the student will be able to achieve the following outcomes.

Cos	Course Outcomes	POs
1	Able to represent various types of signals.	3
2	Acquire proper knowledge to use various types of Transducers.	3
3	Able to monitor and measure various parameters such as strain, velocity,	2
4	Acquire proper knowledge and working principle of various types of digital	1
5	Able to measure various parameters like phase and frequency of a signal with the help of CRO.	3
6	Acquire proper knowledge and able to handle various types of signal analyzers.	

Syllabus:

UNIT-I:

Objective: To study various types of signals and their representation.

Signals and their representation

Measuring Systems, Performance Characteristics, – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors – Statistical analysis of random errors – Signal and their representation – Standard test, periodic, aperiodic, modulated signal – Sampled data pulse modulation and pulse code modulation.

UNIT-II:

Objective: To study various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc.

Transducers

Definition of transducers – Classification of transducers – Advantages of Electrical transducers – Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers – LVDT Applications – Strain gauge and its principle of operation – Gauge factor – Thermistors – Thermocouples – Synchros – Piezo electric transducers – Photo diodes.

UNIT-III:

Objective: To study and measure the various types of Non-electrical quantities.

Measurement of Non-Electrical Quantities

Measurement of strain – Gauge Sensitivity – Displacement – Velocity – Angular Velocity – Acceleration – Force – Torque – Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

UNIT–IV:

Objective: To study various types of digital voltmeters

Digital Voltmeters

Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Micro processor based ramp type – DVM digital frequency meter – Digital phase angle meter.

UNIT–V:

Objective: To study the working principles of various types of oscilloscopes and their applications.

Oscilloscope

Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope – Analog and digital type data logger – Transient recorder.

UNIT–VI:

Objective: To study various types of signal analyzers.

Signal Analyzers

Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters.

TEXT BOOKS:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co.

REFERENCE BOOKS:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doebelin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson / Prentice Hall of India
4. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D. Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.