IV Year B.Tech. ECE I - Semester

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EC435-ELECTRONIC MEASUREMENTS& INSTRUMENTATION

Course Description & Objectives:

To introduce to the students the operation of various electronic Instruments which are used to measure the basic parameters, oscilloscopes, function generators, wave analyzers and various sensors and transducers

Course outcomes:

Upon successful completion of this course, students should be able to:

a. *A brief look on electrical, electronics and computer measurement and their application, terms, error calculation, error and data case study*
b. *Operation and calculation of different DC and AC bridges to measure inductance, capacitance and frequency*
c. *Able to know different instruments*
d. *To familiar with oscilloscope operations*
e. *To identify various sensors, Transducers and their brief Performance specifications.*
f. *To understand principle of working of various transducers used to measure Temperature, Displacement, Level, and various miscellaneous other sensors.*

UNIT I - Electro Mechanical instruments and their characteristics: Static characteristics, Dynamic Characteristics, Errors: Gross error, systematic error, Random error, limiting error, Probable error. Electro Mechanical Instruments: Suspension galvanometer, PMMC mechanism, DC Ammeters, DC Volt meters, Ohmmeter, multi range ohmmeter, calibration of DC instruments. AC meters: Electro dynamometer, Rectifier meter, Thermo instruments, Watt hour meter, and power measurement using dynamometers, power factor measurements, and instrument transformers.

UNIT II - AC & DC Bridges & Electronic Instruments :

DC Bridges: Wheat stone bridge, Kelvin's double bridge. AC Bridges: Measurement of inductance: Maxwell's bridge, Anderson bridge. Measurement of capacitance: Schering Bridge, Hays Bridge, Measurement of frequency: Wien's Bridge, Errors and precautions in using bridges. Electronic Instruments: Amplified DC Meter, True RMS responding Voltmeter, Electronic multimeter, Digital Voltmeter, Q-meter.

UNIT III - Signal Generators & Signal Analysis & Frequency Counter & Time Interval Measurement :

Signal Generator: Sine wave Generator: Sweep Generator, Pulse and Square Wave Generator, Frequency Synthesized Generator, Function Generator. Wave Analyzers: Harmonic Distortion Analyzer, FT spectrum analyzer, applications. Frequency Counter & Time Interval Measurement: Simple Frequency Counter, Time Period measurement, Precision Computing counter using dual counters

UNIT IV - Display Devices & Recorders and Signal Conditioning Devices:

Display Devices: CRO Principles and operation and its applications, dual beam, dual trace oscilloscope, LCD, LED, Plasma displays. Recorders: Types of recorders, Strip chart recorders, XY recorders, Magnetic tape recorders. Signal Conditioning Devices: Signal conditioning, the op-amp, protection, filtering

UNIT V - Sensors & Transducers :

Classification of Transducers, strain gauge, photoelectric transducers, capacitive, inductive transducers, LVDT Thermoelectric transducers, load cell, light and proximity sensors, data acquisition systems.

TEXT BOOKS :

1. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumen-tation and Measurement Techniques" 5th ed., PHI, 2002.
2. R.K. Rajput, "Electronic Measurements and Instrumentation", 2nd ed., S. Chand, 2009.

REFERENCES BOOKS :

1. David A. Bell, “Electronic Instrumentation & Measurements”, 2nd ed., PHI, 2003.
2. A.K. Sawhany, “Electrical and Electronics Measurements & Instrumentation”, Dhanpath Roy & Co, 200.