IV Year I Semester	L	T	P	C
Code: 17EE731	3	1	0	3

INSTRUMENTATION
(Professional Elective-II)

Preamble

Instrumentation is necessary for the proper maintenance of industry and it plays a vital role in it. Now-a- days the day to day manual maintenance is being replaced by simply monitoring systems implemented with various instruments. This course gives an insight into the overall maintenance of the industry.

Learning objectives:

1. To study various types of signals and their representation.
2. To study various types of signal generators.
3. To study various types of signal analyzers.
4. To study the working principles of various types of oscilloscopes and their applications.
5. To study various types of digital voltmeters
6. To study various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc. and measure the various types of Non–electrical quantities.

UNIT–I

Performance of Instruments

Introduction, block diagram of instrumentation system, Static Characteristics-Accuracy, Resolution, Precision, expected value, Error, Sensitivity, Dynamic Characteristics-speed of response: Fidelity, Lag and Dynamic error. Errors in Measurement, Gross Errors, Systematic Errors, Statistical analysis of random errors

UNIT–II

Signal Generators

Signal Generators: Fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse waveform generator.

UNIT-III

Signal analyzers

Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzer, Q meter, Peak reading and RMS voltmeters

UNIT–IV

Oscilloscopes

Cathode ray oscilloscope, CRT features Time base generator, Horizontal deflection system and vertical amplifiers, Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Lissajous method of phase and frequency, standard specifications of CRO.

UNIT–V

Digital Voltmeters

Digital voltmeters: Ramp type, dual–Slope integration type, Successive approximation type, and continuous balance type, Microprocessor based ramp type DVM, digital frequency meter, Digital phase angle meter, digital tachometer.

UNIT–VI

Transducers and their measurements

Definition, Classification, Advantages of Electrical transducers, Characteristics and choice of transducers, active & passive transducers: Resistance, Capacitance, inductance, Strain gauges, LVDT, Piezo-electric transducers, Resistance Thermometers, Thermocouples, thermistors, sensistors, Measurement of physical parameters: force, pressure, velocity, displacement, humidity, and proximity, Data acquisition systems.

Learning Outcomes:

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

Text books:

1. Electronic Instrumentation–by H.S. Kalsi Tata MC Graw–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. Principles of Measurement and Instrumentation – by A.S Morris, Pearson / Prentice Hall of India
3. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.