LNCT University
Diploma EX, IV Semester Syllabus

ELECTRONICS INSTRUMENTATION (DEX-405)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO-1	Understand the fundamentals of instrumentation systems, explain the structure of an instrumentation system using block diagrams.
CO-2	Identify and apply appropriate sensors and transducers, classify transducers based on their operation and application.
CO-3	Understand signal conditioning and display techniques, Explain the need for signal conditioning and use of amplifiers and filters.
CO-4	Operate and interpret electronic measuring instruments, use instruments like DMM, CRO, function generator, and LCR meter for various measurements.
CO-5	Explain data acquisition and control system concepts, describe the architecture and working of a data acquisition system (DAS).

UNIT I: FUNDAMENTALS OF INSTRUMENTATION

Introduction to instrumentation and measurement system, functional block diagram of an instrumentation system, static and dynamic characteristics of instruments, accuracy, precision, sensitivity, resolution, range, hysteresis, errors in measurement and their types.

UNIT II: TRANSDUCERS AND SENSORS

Introduction to transducers and classification, selection criteria of transducers, displacement, pressure and temperature sensors: LVDT, strain gauges, thermocouples, RTD, thermistors, optoelectronic sensors: photodiodes, phototransistors, LDRs, Proximity and ultrasonic sensors.

UNIT III: SIGNAL CONDITIONING AND DISPLAY SYSTEMS

Need for signal conditioning, amplifiers: instrumentation amplifiers, isolation amplifiers, filters: low pass, high pass, band pass, analog-to-digital (ADC) and digital-to-analog (DAC) converters, digital display systems: LED, LCD, 7-segment displays, Introduction to digital meters: voltmeter, ammeter, frequency meter.

Unit IV: ELECTRONIC MEASURING INSTRUMENTS

Digital multimeter (DMM), cathode ray oscilloscope (CRO), working and block diagram, dual trace and storage CRO, function generator and frequency counter, LCR meter, calibration and maintenance of measuring instruments.

UNIT V: DATA ACQUISITION AND CONTROL SYSTEMS

Introduction to Data Acquisition System (DAS), block diagram and working, Sensors to processor interfacing, microcontroller-based measurement systems (basic idea), Introduction to SCADA and PLC in instrumentation, Applications in industries: temperature, level and pressure monitoring.

List of Suggestive Experiments: -

1. Measurements of instrument characteristics observe and calculate accuracy, precision, resolution and sensitivity using basic measuring instruments (e.g., voltmeter, ammeter).
2. Demonstration of error types in measurement, displacement measurement using LVDT, strain gauge characteristics and measurement.
3. Temperature measurement using thermistors and RTD.
4. Working of thermocouple and cold junction compensation, measure temperature differences using a thermocouple and calibrate it.
5. Study of optoelectronic sensors.
6. Study of instrumentation amplifier.
7. Measurement using digital voltmeter and ammeter.
8. Study and use of CRO (cathode ray oscilloscope).

Reference Books: -

1. Electronic Instrumentation, H.S. Kalsi.
2. Measurement and Instrumentation Principles, Alan S. Morris
3. Transducers and Instrumentation, D.V.S. Murty.
4. Modern Electronic Instrumentation and Measurement Techniques, Helfrick & Cooper.