Course Code: ELE-501
Course Title: Instrumentation & Control Theory
Number of Credits: 04 **Total Hours: 60** **Total Marks: 100**
Effective from AY: 2022-23

Prerequisites for the course		
knowledge of analog and digital electronics, Basics of differential equations.		
Objectives of Course		
This course is intended to: • Introduce principles of transduction and actuator. • Explain the important parameters used in instrument characterization, Types of error committed by a user and how to deal with them. • Describe various standards followed for accurate measurement. • Explain the techniques used to convert analog data into digital domain and its analysis and storage. • Understand instruments such as Oscilloscope, spectrum analyzers, wave analyzers, Lock in amplifiers depth. • Fundamentals of control theory and working of PID controller tuned for a given application.		
Course Content		
Unit I	**Introduction**	**8 Hours**
Basic Concepts of measurements, Calibrations and standards, Transducers: Types and parameters, Sensors - Displacement, Strain, Vibration, Pressure, Flow, Temperature, Force and Torque		
Unit II	**Signal Conditioning**	**8 Hours**
Introduction, Amplification, Simple ended amplifier, Instrumentation amplifier, Types of Filters		
Unit III	**Sampling**	**8 Hours**
Fundamental concepts, Anti-aliasing, Multiplexers, Sample and Hold, Track and Hold.		
Unit IV	**Computer Interfaces**	**08 Hours**
Serial (RS-232), Parallel, GPIB (IEEE-488), Universal Serial Bus (USB) and Variants, Bluetooth		
Unit V	**Display Devices**	**10 Hours**
Review of LED, LCD, Plasma display devices, segmental and dot matrix displays, MEMS display		
Unit VI	**General Purpose Test Equipments**	**08 Hours**

CRO, Digital storage oscilloscope, Digital voltmeter, Wave Analyser, Spectrum analysis, Lock-in-amplifiers, Pulse generators and waveform generators		
Unit VII	**Control System**	**10 Hours**
Types of control system - open loop, closed loop, linear, non-linear, continuous, discrete, frequency and time response, open loop motor control, Principles of PD, PI, PID		
Pedagogy		
Lectures/Experiential Learning		
Course Outcome		
students will: ● Explain measurement parameters, calibrations and standards in electronic instrumentation. ● Comprehend the significance of signal conditioning and sampling theorem. ● Gain the knowledge of various computer interfaces, and understand the construction, working principle of different display devices and general-purpose equipments used in signal analysis. ● Explain the working principle of different types of control systems.		
References/Readings		
1. H. S. Kalsi, 'Electronic Instrumentation', Tata MacGrow-Hill 2.Joseph J. Carr, 'Elements of Electronic Instrumentation and Measurement', Prentice Hall India. 3.Albert Helfnick and William Cooper, 'Modern Electronic Instrumentation and Measurement Techniques', Prentice Hall India. 4.Robert Northrop, 'Introduction to Instrumentation and Measurements', CRC Press		

(Back to Index)