

Analog System

Semester- III	Subject Code: BS31606	Lectures: 60
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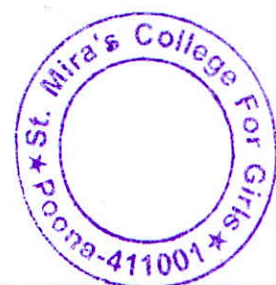
Objectives:

The syllabus aims in equipping the students,

- To understand basics of analog electronics
- To study different types of sensors and discuss their role in electrical and electronic system.
- To understand different types of signal conditioning circuits
- Discuss the need for interfacing circuitry to make the signals produced by sensors, compatible with the system to which they are connected.
- To learn data conversion techniques
- To apply knowledge of analog systems in different applications

Unit 1: Analog Electronic System	14
<ul style="list-style-type: none"> • Introduction of analog electronic systems. Definition of sensors and transducers. Classification of sensors: Active and passive sensors. • Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. • Temperature sensors LM-35, Thermocouple, pH sensor, optical sensor (LDR), Passive Infrared sensor (PIR), Accelerometer sensor, LVDT, tilt sensor, touch screen sensor(Capacitive type), ultrasonic sensor. 	

Unit 2: Signal Conditioning	14
<ul style="list-style-type: none"> • Introduction to signal conditioning, Signal conditioning of passive sensors using Wheatstone 's bridge, Level Shifter, Amplification: Inverting and non inverting Amplifier. Instrumentation amplifier: Three OP-amp configurations. • Filters: active and passive filters, Concept of Order of filters. Working principle of Single order Op-Amp based Low Pass Filter, High Pass Filter, Band Pass Filter, Notch Filter, and Band reject filter. 	



Unit 3: Data Converters	12
<ul style="list-style-type: none"> • Need of data convertors. • Digital to Analog Converter (DAC): Resistive divider, R-2R ladder, Parameters: Linearity, resolution, accuracy, full-scale output voltage. • Analog to Digital Converter (ADC): Types of ADC- Flash, Successive approximation, dual slope, Parameters of ADC: Linearity, resolution, conversion time, accuracy. • Applications of DAC and ADC. 	
Unit 4: Case studies	8
<ul style="list-style-type: none"> • Temperature monitoring system using LM35 • Intruder detector system using PIR sensor • Water Level Indicator system using float switch • Electrocardiograph system (ECG). 	

*Contact hours – 12 hours

Recommended Text / Reference Books:

1. Dr. A. D. Shaligram, *Sensors & Transducers*, CTC publications.
2. Ramakant Gaikwad, *Op-Amps and Linear Integrated Circuits*, PHI: 4th Ed.
3. H. S. Kalsi, *Electronic Instrumentation*, TMH: 2nd Ed.
4. Albert D. Helfrick, William D. Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, PHI publications
5. K.A. Bakshi, A. V. Bakshi and U. A. Bakshi, *Electronic measurements*, Technical publications.
6. A.K. Sawhney: Dhanpat Rai & Sons, *A Course in Electrical and Electronic measurements and Instrumentation*, Educational & technical publishers.
7. R. Khandpur, *Handbook of Biomedical instrumentation*, Tata McGraw Hill Publications 2003.

