

Course Outcomes:

- Know the basic uses of 555 timer and PLL.
- Understand concepts of various industrial sensors.
- Familiar with A/D and D/A conversion.
- Understanding applications of OpAmp.

Unit – 1

Timer and PLL: Functional block diagram of 555 Timer, Monostable operation and its Application, Astable operation and its Applications. Phase Locked Loop: Functional block diagram – Phase detector / Comparator, Voltage Controlled Oscillator, Low pass filter, Applications: Frequency multiplier/ Division, AM detection.

Unit – 2

Operational Amplifier: Inverting and non-inverting amplifier, Op-amp parameters, Summing Amplifier, Difference Amplifier, Integrator, Differentiator, Instrumentation Amplifier, Audio Amplifier (LM386), Voltage to current converter, Current to Voltage converter, Sample and Hold circuits. First order active filters: Construction, working and applications of Low pass, High pass, Band pass, Band reject and all pass filters. Phase-shift and Wein bridge oscillator using op-amp (Circuit diagram and formula only).

Unit – 3

Transducers: Transducers, types, working of transducers., Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, bridge circuits, Semiconductor strain gauge), Capacitive (diaphragm), Hall effect sensors, Magnetostrictive transducers, Microphone, Touch Switch, Piezoelectric sensors, light (photo-conductive, photo emissive, photo voltaic, semiconductor, LDR), Temperature (electrical and non-electrical), Pressure sensor.

Unit – 4

A-D and D-A Conversion: D-A conversion: 4bit binary weighted resistor type, circuit and working. Circuit of R-2R ladder- Basic concept. A-D conversion characteristics, successive approximation ADC. (Mention the relevant ICs for all).

Suggested References:

- ✓ *Analog Electronics: Devices and Circuits.*, B. C. Sarkar and S. Sarkar, 1 st Edition, Damodar Group publisher., 2016
- ✓ *Measurement Systems*, Doebelin., 4 th edition, TMH, New York, 1992.
- ✓ *Electrical Measurements & Electronic Measurements.*, A.K. Sawhney., Dhanpat Rai & Co. (P) Limited., 2015

- ✓ *Digital Electronics: Circuits and Systems*, B. C. Sarkar and S. Sarkar, S U T Prakashani Burdwan, 2018
- ✓ *Instrumentation- Devices and Systems.*, Rangan, Sarma, and Mani, 2 nd Edition., Tata-McGrawHill., 2008
- ✓ *Electronic Instrumentation.*, H.S Kalsi, 3 rd Edition., McGraw Hill., 2017
- ✓ *Instrumentation measurements and analysis.*, Nakra&Choudhary., 3 rd Edition., TMH., 2017
- ✓ *Op-Amps and Linear IC"s*, R. A. Gayakwad, 4 th Edition., Pearson Education., 2000
- ✓ *Electronic Sensor Circuits and Projects, III Volume*, Forrest M Mims, Master Publishing Inc.,2006.
- ✓ *Timer, Op Amp, and Optoelectronic Circuits & Projects*, Forrest M Mims, 1 st Edition., Master Publishing Inc., 2004.

Practical:

1. Arithmetic operations using OpAmp
2. R-2R ladder D/A converter using ICS
3. Study of PLL and 555 timer Ics
4. Low pass filter design
5. Familiarization of sensors