

Amended Course as passed by the Subject Committee Meeting held on Feb. 29, 2004.

ELE 221.3 Instrumentation (3 -2 -2)

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objective:

1. To provide knowledge of instrumentation.
2. To give knowledge of measurements.
3. To develop skills of instrumentation system.

Course Contents:

- 1. Introduction to Instrumentation System (3 hrs)**
Components of Instrumentation and their function, Transducing, signal conditioning and transmission, Output device, Type of signals in instrumentation.
- 2. Signal Measurements (12 hrs)**
Units and standards of measurements, Measuring instruments, performance parameters, Dynamic parameter, Review of Wheat stone, inductance and capacitance bridges, error, Probability of errors, Normal distribution.
- 3. Physical Variables and transducers (12 hrs)**
Physical variables and their types (Electrical, Mechanical, Process, bio-physical variable), Types, Principle of operation, input and output characteristics and applications of transducers (resistive, capacitive, inductive, voltage and currents), calibrations and error in transducers.
- 4. Signal Conditioning and Processing (8 hrs)**
Importance of signal conditioning, signal amplification, filtering, and wave shaping, instrumentation, amplifier, OpAmp in instrumentation.
Isolation amplifiers principles and essentials of isolation amplifiers, Applications, interference signals and their elimination, signal conversion (Analog – to – digital, Digital – to analog).
- 5. Data Transmission (4 hrs)**
Transmission types, Transmission schemes, Data transmission system and standards.
- 6. Output Devices (3 hrs)**
Indication instruments, Magnetic data recorders, Strip – chart, S-Y display unit and Plotter.

7. **Data Acquisition Systems** (3 hrs)
Components of Analog and Digital Data Acquisition System, Use of Data Acquisition Systems, Modern trends in data acquisition system.

Laboratory:

1. Conversion of physical variables into electrical signal.
2. Signal conditioning using active devices or OpAmp.
3. Measurement of physical variables using various Bridges.
4. Error measurements in instrumentation system.
5. Observation of interference in instrumentation and their remedy.
6. Transmission of signal in different mediums.
7. Conversion of analog signal into digital and digital into analog signal.

Text Book:

1. A.D. Helfrick and W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 1996.

Reference Books:

1. S. Wolf and R.F.M. Smith, *Student Reference Manual for Electronic Instrumentation* Laboratories, prentice Hall of India, 1996.
2. E.O. Deobelin, *Measurement System : Application and Design*, McGraw Hill, 1990.
3. a.K. Sawhney, *A Course in Electronic Measurements and Instrumentation*, Dhanpat Rai and Sons, India, 1998.
4. C.S Rangan, G.R Sarma and V.S.V Mani, *Instrumentation Devices and Systems*, Tata McGraw Hill, India, 1992.
5. D.M. Considine, *Process Instruments and Control Handbooks*, McGraw Hill 1985.