

Course Type	Course Code	Name of Course	L	T	P	Credit
E/SO	ECE201	Measurements and Instrumentation	3	0	0	9

Course Objective

In this course will learn the basic concepts of measurement and fundamentals of bridge measurements. Electronic measuring instruments basic principle of operation will be covered in the course. The frequency domain measurements will be covered followed by digital instruments. Finally transducers for measurement of non-electrical quantity measurements will be covered in detail followed by interfacing with data acquisition system.

Learning Outcomes

Upon successful completion of this course, students will:

- Have an understanding of the basic concepts of measurement
- Acquire an understanding of the working principles of commonly used electronic instruments.
- Have a knowledge of digital measurements.
- Have an understanding of different transducers.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Basic Measurement Concepts: Measurement systems, Static and dynamic characteristics, units and standards of measurements, error, accuracy and precision, types, statistical analysis, Moving coil, moving iron meters and multimeter. Bridge Measurements: Wheatstone, Kelvin, Maxwell, Hay, Schering, Anderson and Wien bridge.	10	Understanding the basic concepts in measurements Familiarization of working of conventional meters Understanding of impedance transducers
2	Electronic Measurements: Digital storage oscilloscope, delayed time base oscilloscopes, analog storage oscilloscope, sampling oscilloscope. Q meters, vector impedance meter, vector voltmeter, RF voltage and power measurements, true RMS meters	9	Understanding of electronic measurements and instruments for different parameters
3	Signal Analysers: Frequency synthesizer, wave analyzer, harmonic distortion analyzer, spectrum analyzer – analog and digital, vector network analyzer	7	Understanding of parameters of signals/waves and its measurements
4	Digital Instruments: Frequency counters – measurement of frequency and time interval, extension of frequency range, automation in digital instruments	6	To get the knowledge about digital methods of measurements
5	Transducers and Data Acquisition Systems: Sensors and Transducers, Classification, transducer for measurement of temperature, displacement, pressure, force, torque and strain, fiber optic transducers, ultrasonic transducers. Elements of a digital data acquisition system – interfacing of transducers	10	Understanding of basic transducers, working principle of different transducers, measurements and displaying in display devices

Text Books

1. Albert D. Helfrick and William D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Pearson, 2016 India.
2. Bernard M Oliver and John M Cage, Electronic Measurement and Instrumentation, Tata McGraw Hill, 2008 India

References

1. Introduction to Instrumentation and Measurements, Robert B. Northrop, CRC Press (2005).
2. Joseph J. Carr, Elements of Electronics Instrumentation and Measurement, Pearson, 2003 India
3. Alan. S. Morris, Principles of Measurements and Instrumentation, 2nd Edition, Prentice Hall of India, 2003.
4. David A. Bell, Electronic Instrumentation and measurements, Prentice Hall of India Pvt Ltd, 2003.
5. A.K. Sawhney, "A Course in Electrical and Electronic Measurement and Instrumentation, Dhanpat Rai and Co, 9th Ed. 2012.