

Measurement and Control Systems

Course Code:	28569
Credits:	2
Course Type:	Theoretical
Prerequisites:	Termodynamics1, Strength of Materials1, Fluid Mechanics1
Corequisites:	Vibrations
Course Length:	34 hours

Outline:

- **Introduction** (Definition, Application and Importance of Measurement, Generalized Configurations and Functional Descriptions of Measuring Instruments, Classification of Measurement Systems) (2 weeks)
- **Probability and Statistics** (Errors and Uncertainty in Measurement, Statistical Analysis of Measurements, Normal Probability Density Function, Confidence Interval, t-Student's Distribution, Uncertainty Propagation, Curve Fitting and Regression, Design Stage Uncertainty Analysis) (2 weeks)
- Measurement System Behavior (Static and Dynamic Characteristics of Measurement Systems, Static Performance Parameters, Calibration, Dynamic Performance Parameters) (3 weeks)
- Sensors and Transducers (Displacement Measurements, Strain Measurement and Load Cells, Temperature Measurements, Pressure Measurements, Acceleration Measurements, Flow Measurements, Piezoelectric) (4 weeks)
- Electrical Measurement and Conditioning (Wheatstone Bridge, Operational Amplifier, Op-amp Circuits Analysis, Passive and Active Filters, Sample and Hold, Analog to Digital and Digital to Analog Converters) (3 weeks)
- Modern Sensors (MEMS, NEMS) (2 weeks)

References:

1-Figliola, R. S., & Beasley, D. E. (2014). Theory and design for mechanical measurements.

John Wiley & Sons (Main Reference).

2 -Nakra, B. C., & Chaudhry, K. K. (2003). Instrumentation, measurement and analysis. Tata McGraw-Hill Education.

3- رضایی امیرحسین، ذهابی محمدرضا، اندازه گیری الکترونیکی، انتشارات دانش نگار، سال ۱۳۹۳.

4 -Northrop, R. B. (2018). Introduction to instrumentation and measurements. CRC press.

5 -Holman, J. P. (1984). Experimental Methods for Engineers. Mc Graw-Hil.

6- Doebelin, E. O. (1995). Engineering Experimentation. Mc Graw-Hill.