ME 323: Mechanical Measurements (3-0-0-6)

Fundamentals of Measurement: Elements of a generalized measurement system, standards, and types of signals ; Static performance characteristics. Dynamic performance, instrument types - zero, first and second order instruments, transfer function representation, system response to standard input signals - step, ramp, impulse, and frequency response; Treatment of uncertainties: error classification, systematic and random errors, statistical analysis of data, propagation and expression of uncertainties; Measurement of various physical quantities: Linear and angular displacement, velocity, force, torque, strain, pressure, flow rate and temperature; Transfer functions of some standard measuring devices; Data Acquisition and processing: Digital methods, digitization, signal conditioning, interfacing, standard methods of data analysis - quantities obtainable from time series; Fourier spectra, DFT, FFT; Data acquisition parameters - sampling rate, Nyquist sampling frequency, aliasing & leakage errors; Metrology: measurement of angles, threads, surface finish, inspection of straightness, flatness and alignment, gear testing, digital readouts, coordinate measuring machine.

Texts:
[1] E.O. Doebelin, Measurement systems-Applications and Design, 4th Ed., Tata McGraw-Hill, 1990.
[2] T. G. Beckwith, R.D. Marangoni and J.H. Lienhard, Mechanical Measurements, Addison Wesley, 1993.

References:
[3] R. S. Figiola and D. E. Beasley, Theory and design for mechanical measurements, 2nd Ed., John Wiley, 1995.
[4] J. W. Dally, W.F. Riley and K.G.McConnell, Instrumentation for engineering measurements, 2nd Ed., John Wiley & Sons, 1993.
[5] E. O. Doebelin, Engineering Experimentation, McGraw-Hill, 1995.
[6] Connie L Dotson, Fundamentals of Dimensional Metrology, Cengage Learning, 2015