

### **ME 680 Experimental Methods (2-0-2-6)**

Theory and Experimentation in Engineering: Problem solving approaches, Types of engineering experiments, computer simulation and physical experimentation; Generalized measuring system, types of inputs, analog and digital signals, standards, calibration and uncertainty, Measurement System: Performance characteristics, static performance characteristics-static calibration-linearity, static sensitivity, repeatability, hysteresis-threshold- resolution, readability and span; Analysis of Experimental Data : Causes and types of experimental error, un-certainty analysis, statistical analysis of data, probability distributions and curve fitting; Dynamic performance characteristics; Input types; Instrument types- zero order instrument, first order instrument, second order instrument; Experiment Plans: Model building; Measurement Methods and Applications : Measurement of force and torque; Measurement of strain and stress; Measurement of pressure; Flow measurement and flow visualization; measurement of temperature; optical methods of measurements; Data Acquisition and Processing : Types and configurations of DAS, signal conditioning, A/D, D/A conversion; Design, Planning, Execution and Analysis of experimental projects

#### *Textbooks:*

- [1] Beckwith, Buck, and Marangoni, *Mechanical Measurements*, Narosa Publishing House, 1995.
- [2] Doeblin, *Measurement Systems - Application and Design*, 4e, McGraw-Hill, 1990.
- [3] Holman, *Experimental Methods for Engineers*, 6e, McGraw-Hill, 1994.
- [4] Doeblin, *Engineering Experimentation*, McGraw-Hill, 1995.