



EE442-Advanced Instrumentation (Elective Course)

Code and Name: EE 442 Advanced Instrumentation

Credit Hours: 3 (Lecture: 3, Tutorial: 1)

Textbook:

- Instrumentation, Measurements and Analysis, B C NAKARA and K K Chaudhry, Third Edition, McGraw.

Other References:

- Instrumentation Theory and Application, Alan S. Morris, Tenth Edition, Academic Press.

Course Description:

Review of Instrument Types and Performance Characteristics, Measurement Uncertainty, Calibration of Measuring, Measurement signal transmission Variable conversion elements, , Motion and vibration measurements, Dimensional Metrology, Force Measurements, Flow Measurements, Acoustics Measurements, Intelligent Devices, Fiber optical sensors, Gas detectors, Measurement Reliability and Safety Systems, Ultrasonic transducers.

Pre-requisites: EE361 and EE341

Co-requisites: None

Course Learning Outcomes:

With relation to ABET Student Outcomes (SOs: 1-7)

1. Recognize the difference between static and dynamic characteristics of Instruments. (1)
2. Select appropriate piezoelectric accelerometers for dynamic motion measurement. (6)
3. Quantify intelligent instruments reliability. (1)
4. Design of a typical safety system. (2)
5. Design and Implement active filters using Labview and NILEVIS data acquisition Card. (2)
6. Analyze, Interpret and discuss experimental results to improve instrumentation process. (6)

Topics to be covered:

- Review of Instrument Types and Performance Characteristics, Measurement Uncertainty, Reduction of Errors.
- Statistical Analysis of Measurements Subject to Random Errors, Aggregation of Measurement System Errors, Total Error When Combining Multiple Measurements, Calibration of Measuring Sensors and Instruments; Principles of Calibration, Calibration Chain and Traceability, Calibration Records.
- Measurements, Methods and application: Motion and vibration, Dimensional Metrology, force measurements.
- Torque, flow and power Measurements, intelligent pressure sensors.
- Acoustics measurements: Loudness, Typical sound-Measuring System.
- Measurement Reliability and Safety Systems: Principles of Reliability, Improving Measurement System Reliability, Safety Systems, Design of a Safety System.
- Gas detectors, Fiber Optical sensors, Fiber-Optic Temperature Sensors.
- Ultrasonic Transducers, Intelligent Temperature-Measuring Instruments.

Grading Policy:

The grading for the course are 60% coursework and 40% Final Exam. The coursework consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, homework, and projects for the remaining 20% that is modified by the course instructor.

