



Mechanical Engineering Dept. Department

Syllabus

ME 452: Measurements and Lab Project (0-3-1)

Course Catalog Description:

Design of experiments, sensors selection, wiring and calibration, uncertainty analysis, data acquisition, Introduction to LabVIEW software. Measurements of pressure, temperature and flow. Design and implementation of different control actions to electromechanical, fluid and thermal systems. Lab projects include measurements and control of mechanical or thermal systems.

Course Co-requisites:

- ME 451: Design & Analysis of Engg Exp.

Course Objectives:

1. Apply the basic concepts related to design of experiments, including uncertainty analysis
2. Demonstrate the ability to select and interface different components in measuring system for accurate measurements
3. Calibrate different sensors and other related components.
4. Use LabVIEW software to acquire, record, and analyze experimental data, in addition to building controllers.
5. Design and implement different controllers to various mechanical systems
6. Work in teams and practice enhanced report writing and presentation skills

Course Learning Outcomes:

- CLO1. Basic concepts related to design of experiments
- CLO2. Calibrate different sensors
- CLO3. Use LabVIEW software
- CLO4. Work in teams

Learning Resources:

- Measurement and Instrumentation: Theory and Application, Alan S. Morris and Reza Langari, Elsevier, 2012
- Theory and Design for Mechanical Measurements, 5th Edition, Richard S. Figliola and Donald E. Beasley, John Wiley & Sons, Inc. 2011
- Experimental Methods for Engineers, by Holman, J. P., McGraw Hill, 2011.

Lab Assessment Plan:

| Assessment Task | Week Due | Weight |
|----------------------------------|----------|--------|
| Final Exam | 15th | 15.0% |
| Homework on Uncertainty analysis | 3rd | 10.0% |
| Homework on LabView | 5th | 10.0% |
| LabView Project | 7th | 15.0% |
| Lab Reports | Weekly | 45.0% |
| Attendance and Participation | Weekly | 5.0% |

Lab Weekly Schedule:

| Week# | Topics |
|-------|--|
| 1 | Design of experiments and sensors selection |
| 2 | Uncertainty analysis |
| 3 | Introduction to LabVIEW software |
| 4 | Introduction to LabVIEW software (Continue) |
| 5 | Measurements of pressure |
| 6 | Vibration measurements |
| 7 | Vibration measurements (Continue) |
| 8 | temperature measurements |
| 9 | temperature measurements (Continue) |
| 10 | flow measurement |
| 11 | Lab projects include measurements and control of mechanical or thermal systems |
| 12 | Lab projects include measurements and control of mechanical or thermal systems (Continue) |
| 13 | Design and implementation of different control actions to electromechanical, fluid and thermal systems. |
| 14 | Design and implementation of different control actions to electromechanical, fluid and thermal systems. (Continue) |
| 15 | Design and implementation of different control actions to electromechanical, fluid and thermal systems. (Continue) |