**MECHANICAL ENGINEERING PROGRAM**

**ABET COURSE SYLLABUS**

**ME 337: Engineering Measurements Laboratory (1 credit): Required**

**Course Description (2008-2010 Catalog):**

Laboratory instruction involving oscilloscopes, strain gauges, temperature probe calibration, use of pressure transducers, flow measurement devices and analog-to-digital converters for computer-aided data acquisition.

**Corequisite Course: ME337 or consent of instructor**

**Prerequisite by Topic:**

- Electrical Circuit
- Physics

**Textbook:**

Laboratory handouts

"Theory and Design for Mechanical Measurements," 3rd edition, R.S. Figliola, D.E. Beasley (2000)

**Other Reference Material:** N/A

**Course Coordinator:** Woosoon Yim, Professor

**Course learning outcomes:**

- **i.** Measurement process planning including selection of correct transducers and signal conditioning units commonly encountered in mechanical engineering:
- **i.** Basic hardware set up of PC based data acquisition and control system and software programming skill in LabVIEW
- **ii.** Handling and characterization of typical dynamic signals encountered in mechanical engineering in discrete form (DFT, FFT, sampling rate, frequency resolution, dynamic bandwidth)

**Relationship of Course to Mechanical Engineering Program Educational Outcomes:**

| Goal1: Provide mechanical engineering graduates with technical capabilities. | | | | | Goal 2: Prepare the mechanical engineering graduates to have effective workplace skills. | | | | Goal 3: Instilling a sense of responsibility as a professional member of society. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.a** | **1.b** | **1.c** | **1.d** | **1.e** | **2.a** | **2.b** | **2.c** | **2.d** | **3.a** | **3.b** | **3.c** | **3.d** |
| **M** | **H** | | **H** | **L** | **L** | | **L** | | | | | |

**( L)ow (M)edium (H)igh**

**Topics Covered:**

ME337L is designed to provide undergraduate students hands-on experiences in the engineering measurement commonly encountered in mechanical engineering. Emphasis is given to (1) computer aided data acquisition fundamentals, analysis of measurement data, and programming instruction using graphical programming language LabVIEW (2) Dynamic signal characterization using Discrete Fourier Transformation (DFT) and dynamic response of measurement systems (3) hands-on experience in calibration of various transducers (encoder, tachometer, thermocouples, RTD, thermistor, strain gauges) and signal conditioning of transducer output.

| **Experiment #** | **Laboratory Topics** |
|---|---|

1. Introduction to Graphical Programming Language LabVIEW: Part I
2. Introduction to Graphical Programming Language LabVIEW: Part II
3. Introduction to DAQ in LabVIEW
4. Computer Aided Data Acquisition (Buffered DAQ and Triggering)
5. Digital-to-analog Conversion using LabVIEW
6. Fourier Analysis of Measurement Signals
7. Measurement System Response I
8. Measurement System Response II
9. Statistical Analysis
10. Applied Mechanical Measurement
    - Bridge circuit for resistive transducers
    - Incremental optical encoder
    - Temperature measurement using thermocouple & RTD

**Laboratory Projects:** 9-10 Lab projects

**Assessment of Student Progress toward Course Objectives**

Final exam and laboratory reports, attendance

**Class/Laboratory Schedule:** Meet once per week 3 hours per lab (Spring Semester)

**Contribution of Course for meeting Professional Component:**

| | |
|---|---|
| (a) Mathematics and basic sciences: | 0 credit |
| (b) Engineering Topics (Design/Science): | 1 credit |
| (c) General Education: | 0 credit |
| (d) Others: | 0 credits |

Person who prepared this description:

Woosoon Yim, Professor October 12, 2009