MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 337: Engineering Measurements (3 credit): Required

Course Description (2008-2010 Catalog):

Generalized measurement systems, characteristics of dynamic signals, basic transducer, signal conditioning and recording systems, applied mechanical measurements, and statistical analysis.

Prerequisite Course: EEG 291, PHY 182, 182L, or consent of instructor

Prerequisite by Topic:

- Electrical Circuit
- Physics

Textbook: "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:

1. Acquire the common mechanical measurement signals in the laboratory using either conventional measurement instruments or computer based data acquisition system
2. Design measurement system including the selection of appropriate transducers, signal conditioning units.
3. Understand dynamic characteristics of measurement signal (Fourier analysis) and instruments (frequency response/dynamic bandwidth)
4. Treat measurement data using statistics; probability theory; finite statistics; curve fitting of measurement data and goodness of fit.
5. Analyze the measurement data using uncertainty analysis (design stage and multiple measurement analysis); propagation of individual uncertainties to final measurement results using Taylor series.

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:

1. Fundamentals of PC based data acquisition system, sampling theorem, aliasing frequency, and signal conditioning of transducer output.
2. Dynamic signal characterization and dynamics response of measurement instruments: Fourier analysis of dynamic signal is introduced to students along with dynamic characteristics of measurement instruments. Emphasis is given to (1) discrete Fourier transformation that can be implemented for the PC based computer aided data acquisition system (2) selection of right dynamic parameters for instruments; concept of dynamic bandwidth of instrument; design of instrument for a given dynamic range.
3. Probability, statistical method, and uncertainty analysis: Treatment of measurement data using statistics; probability theory; finite statistics; curve fitting of measurement data and goodness of fit.
4. Uncertainty analysis using design stage and multiple measurement analysis; propagation of individual uncertainties to final measurement results using Taylor series.
5. Operational principles of transducers and signal conditioning units commonly encountered in mechanical engineering
6. Familiarize the basic operational principles of motion measurement, temperature measurement, and pressure measurement. Transducers such as incremental encoder, absolute encoder, tachometer, potentiometer, thermocouple, thermistor, RTD, strain gauges are discussed along with appropriate analog/digital signal processing of transducer output.

Laboratory Projects: None

Assessment of Student Progress toward Course Objectives

Two written exams, home-works, and final exam

Class/Laboratory Schedule: Meet twice per week 75 minutes per lecture (Spring Semester)

Contribution of Course for meeting Professional Component:

(a)	Mathematics and basic sciences:	0 credit
(b)	Engineering Topics (Design/Science):	3 credit
(c)	General Education:	0 credit
(d)	Others:	0 credits

Person who prepared this description:

Woosoon Yim, Professor October 12, 2009