MECE 4372 Controls and Vibrations Laboratory

Fall 2006

Instructor: Professor G. Song
Email: gsong@uh.edu, Tel: x34525
Office Hour: 2:00-3:30 pm, Tue, or by appointment
Office Location: Room N235, Engr. Building 1

2003-2006 Catalogue Data:

MECE 4372: Mechanics-Controls-Vibration Laboratory, Cr. 3(1 1/2-3). Prerequisites: MECE 3360 and MECE 3338. Experimental methods to study dynamic response of structures and process systems. Course includes design of control systems and modification of laboratory hardware.

Textbook: Students to bring the textbooks used in MECE 3338 and MECE 3360 to the laboratory.

Prerequisites by Topic:
MatLab programming, Laplace transforms, Fourier series, operation of measurement equipment, design and execution of experiments, electrical circuit analysis, technical writing, use of personal computers to prepare technical reports.

Topics: (each class is 80 minutes lecture, 160 minutes laboratory per week)

The topics include, but not limited to:
- Brief Review of System Dynamics and Vibrations
- Introduction to Frequency Domain Analysis
- Transfer Functions and Frequency Response, Measuring Bode Plots, model systems
- Laplace Transforms, Fourier Transforms and Fourier Series, Predicting Time Domain System Responses.
- Feedback Control Systems.
- Proportional (P) Control Circuit Design and Construction.
- PID Control, Design and Construction.
- Midterm Examination.
- Labs-to-go Project (Data acquisition and analysis using a Laptop USB based system)
- Semester Project – PD Control System Design, Construction, and Evaluation Based upon Measured Physical System Parameters, Root Locus techniques, system stability, frequency/time domain responses, report writing.
- Final Examination (university scheduled time).

Objectives1:
Objective 1 Apply principles of engineering physics and mathematics to the control of dynamic systems (Objectives A, B)
Objective 2 Integrate knowledge from lecture courses in physics, mechanics, and dynamics in understanding the behaviour and control of practical dynamic systems (Objective B, E).
Objective 3 Work in a group and interact with others to elucidate complex phenomena and thereby advance individual understanding.

Performance Criteria2:
Objective 1. Demonstrate capability to collect and reduce raw data to final results using principles of engineering science (Criteria a, b, c, e, g, k).
Objective 2.
  2.1 Interpret experimental results in terms of all relevant scientific bases without using over simplifications (Criteria a, b, d, e, g, k).
  2.2 Develop and demonstrate capability to make estimates of experimental outcomes prior to
conducting experiments (Criteria a, b, c, e, g, k).

Objective 3.

Plan, propose and execute a series of experiments without prior instructions being given (Criteria a, b, c, d, e, g, k).

Evaluation:
1. Laboratory preparation, conducting experiments, written laboratory reports.
2. Homework assignments/Exams
3. Final grade =
   - Lab Notes 5%
   - Final Project Report 12.5%
   - Labs-to-go Project Report 10%
   - Regular Lab Reports 37.5%
   - Midterm Exam 17.5%
   - Final Exam 17.5%

TA Information:
Mr. Yezeng Cheng
Office Location: Engr. Building No. 1, N153
Office Hours: 1:00-3:00pm, Friday
Tel: x35750
Email: chengyz@gmail.com

Originally prepared by Dr. S. Kleis and modified by Dr. G. Song.

1 Upper case letters in brackets refer to goals of the Dept. of Mech. Engineering
2 Lower case letters in brackets refer to ABET outcomes/assessments under Criterion 3.

Mechanical Engineering Department Objectives for the Undergraduate Curriculum
A) A knowledge of basic mathematics and the natural-engineering- and systems-sciences, as well as the basic skills of learning and critical thinking,
B) a desire for intellectual discovery and exploration of the unknown,
C) an awareness of and interest in the breadth of human intellectual achievement and cultural experience, including the accomplishments of the engineering profession,
D) an appreciation of the ethical, democratic, economic and other value systems, and the formation of such values, and
E) the ability to perform the integration of knowledge in the practice of engineering.

Criterion 3: Program Outcomes and Assessment
a) an ability to apply knowledge of mathematics, science, and engineering
b) an ability to design and conduct experiments, as well as to analyse and interpret data
c) an ability to design a system, component or process to meet desired needs
d) an ability to function on multi-disciplinary teams
e) an ability to identify, formulate and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice