MEM 351 – Dynamic Systems Laboratory I

COURSE OUTLINE

Instructor:	Prof. Paul Oh	Office: Rm. Curtis 156 Email: paul@coe.drexel.edu Office Hours: By Appointment	Tel: 215-895-6396
TA	James Hing (Lead) Robert Ellenberg Keith Sevcik	Email: jth23@drexel.edu Email: Robert.william.ellenberg@drexel.edu Email: Keithicus@drexel.edu	

Lecture	Curtis Rm. 341	Tuesday	13:00 – 13:50
Lab Section 1	UG Lab	Wednesday	09:00 – 11:50
Lab Section 2	UG Lab	Wednesday	12:00 – 14:50
Lab Section 3	UG Lab	Wednesday	15:00 – 17:50

Recommended References:

1. LabVIEW 7 Express Student Edition by Robert Bishop (comes with CD-ROM)

Objectives:

Covers advanced experimental methods in mechanical engineering in the areas of dynamic systems and control. Includes experiments on sensors, actuators, microcomputer data acquisition and control, and the analysis and design of feedback control systems. *Such experiments are designed to develop technical skills in conducting experiments and analyzing data, to produce several distinct outcomes required by the accrediting body, (Criteria 3 a-k), to contribute to the MEM educational objectives, and to satisfy professional components specified by ASME.*

Grade Breakdown

Item	Scheme
Attendance (Lectures and Labs)	15%
4 Homeworks	30%
Lab Report (1 compilation report)	40%
2 Quizzes	15%

A = 85 – 100%; B = 75 – 84%; C = 65 – 74%; D = 55 – 64%; F = Less than 55%

Core Technical Skills:

Provide a "hands-on" experience with sensors, actuators and computer-aided data acquisition	An understanding of transducers, op-amps and filters and how they integrate towards acquiring experimental data and designing control systems
Relate measurements made with sophisticated equipment to those made with basic kinds of measurement techniques	An understanding of basic electronic circuits, data acquisition and signal conditioning
Develop the ability to work together in groups and the organizational and leadership skills required to perform a	An increased skill level in general experimental methods, data analysis, and effective report writing

technical analysis and engineering evaluation

ABET Relation to Program Objective

(0 = No content; 1 = some content; 2 = significant content)

Objective	Conten	Explanation	Evidence*
1. To deliver a comprehensive mechanical engineering curriculum which emphasizes both the foundations and breadth of the mechanical engineering profession	**2**	Advanced laboratory experience in control	Laboratory reports, examinations
2. To provide an education that equips students with the tools necessary to become successful mechanical engineers based on their Co-op experience, strong communication skills and awareness for the need of continuous professional development.	**2**	Students are exposed on modern measurement tools, simulation software and report writing.	Class discussions, laboratory reports, class handouts.
3. To provide an education that will allow mechanical engineering students to understand the social, economic, environmental, political and ethical importance of their future profession.	**1**	Accurate measurement techniques are essential in the functioning and monitoring of engineering systems in automobiles, power plants and other vital areas of the economy.	Guest lecturers discuss relevance of controller design towards engineering systems that solve social, environmental and ethical problems.
4. To provide mechanical engineering students with a thorough understanding of impact of mechanical engineers and the mechanical engineering profession in the development, implementation and creation of future technology	**2**	Development and innovation of diagnostic and measurement tools will be part of the future technology	Guest lecturers discuss relevance of controller design towards engineering systems that solve social, environmental and ethical problems.

Relation to ABET Criteria 3 Outcomes

(0 = No content; 1 = some content; 2 = significant content)

Criteria a - k	Content	Explanation	Evidence
a*. An ability to apply knowledge of mathematics, science and engineering*	**2**	Relevant physics, equations of motion, state space realizations and control techniques are derived	In-class lectures, lab exercises and homework
b*. An ability to design and conduct experiments as well as to analyzed and interpret data*	**2**	Students write software and interface hardware to acquire and process experimental data. They are also required to analyze and interpret the experimental data in the report.	Lab exercises

c. *An ability to design a system, component or process to meet desired needs*	**2**	Controllers are both simulated and implemented experimentally.	Lab Exercises
d. *An ability to function on multidisciplinary teams*	**2**	Three or four students work as a team to use their knowledge in electronics, and computers to achieve the objective of each experiment in this course.	Lab Exercises
e. *An ability to identify, formulate and solve engineering problems*	**2**	The students are required to formulate and solve the control problem based on theory and to verify their experimental results with expected theoretical results.	Lab exercises and homework
f. *An understanding of professional and ethical responsibility*	**1**	This is emphasized as part of the design engineer's overall responsibility.	Guest Lecturers
g. *An ability to communicate effectively*	**2**	Oral and written presentations of the experimental procedure and results are required.	Lab reports and final report
h. *The broad education necessary to understand the impact of engineering solutions in a global or societal context*	**1**	The impact of engineering design on the environment (pollution, greenhouse effect, etc.) and society are covered.	Handout notes and Guest Lecturers
i. *A recognition of the need for and an ability to engage in lifelong learning*	**1**	Improvements in control come from innovations and advanced technology. Need for lifelong learning is recognized.	Handout notes and Guest Lecturers
j. *A knowledge of contemporary issues*	**1**	Design of control systems is related to contemporary issues	Handout notes and Guest Lecturers
k. *An ability to use the techniques, skills and modern engineering tools necessary for engineering practice*	**2**	Students use modern engineering instrumentation and software	Lab exercises

Contribution to Professional Component:

MEM 351 builds upon and provides hands-on laboratory reinforcement of the principles learned in TDEC and in the fundamental mechanical engineering courses. It therefore helps integrate analytical experimental and numerical engineering technique to solve real engineering problems. MEM 351 contributes toward the 1-½ year of engineering topics appropriate to developing the ability to work in the controls and dynamic systems area.