MAE 126A
Environmental Engineering Lab I

Class/Laboratory Schedule: 3 lecture hours and 10 laboratory sections per week

Course Coordinator(s): Jan Kleissl

Textbooks/Materials:
1. Lecture Notes

Catalog Description: Design and analysis of experiments in environmental engineering. Experiments in wind tunnel, water tunnel, and other equipment. Use of instrumentation. Laboratory report writing; error analysis; engineering ethics.

Prerequisites: Grades of C- or better in MAE 101A or CENG 101A, and MAE 125A.

- ☐ Required Course
- ☐ Technical Elective Course
- ☐ Other: _____

Performance Criteria:
(Numbers in parentheses refer to the methods of evaluation used to assess student performance)

Objective 1
1.1 During the duration of the course, students are exposed to three out of the five different laboratory experiments (water tunnel; wind tunnel; material testing, linear circuits and control design). (1,2)
1.2 Experimental work is constructed in such a way that theoretical background of underlying engineering principles is tested thoroughly. (1,2)

Objective 2
2.1 Experimental data is compared with theoretical simulations in Matlab to verify estimated parameters and validity of the models being used. (2)
2.2 Both National Instruments VI interfaces, Matlab and Excel are used to conduct and analyze experimental data. (2)
2.3 Statistics and Error analysis is presented in separate lectures and applied to experimental data gathered in the laboratory environment. (1,2)

Objective 3
3.1 Students learn how to use the laboratory equipment to perform standard data acquisition and to use this data in the more advanced laboratory course MAE171b. (1,2)
3.2 Experimental data is analyzed by using the data to estimate parameters of the system under investigation. (1,2)

Objective 4
4.1 Experiments are planned and designed in coordination with the group of students and the course advisors (2).
4.2 The control experiments are used to design control algorithms and implement these algorithms on the electromechanical system (2).

Objective 5
5.1 Students demonstrate team work by requiring to work in groups of up to four and motivate coordination and cooperation between students. (2)
5.2 Students will present their progress and work in the form of written reports to motivate the writing and organization skills of the students.(2)

Objective 6
6.1 Three mandatory special lectures are devoted to discuss engineering ethics (3).
6.2 Engineering ethics issues are discussed on the basis of a case study and are accompanied with a questionnaire (3).

Objective 7
7.1 Experience in operating large experimental facilities for engineering fluid studies (water and wind tunnel) is obtained (1,2).
7.2 Experience in operating load frame facilities for stress and strain experiments (1,2).
7.3 Experience with electromechanical vibration systems, linear feedback circuits and control system design is evaluated in this course (1,2).

Course Objectives:
(Numbers in parentheses refer to the specific MAE Program Outcomes)

Objective 1: Application of the theoretical concepts of fluid, solid and electromechanical control systems in a laboratory environment (1a, 2b).

Objective 2: Working with real experimental data and compare experiments with predictions and simulations based on theoretical models and perform statistical and error analysis (1a, 2b).

Objective 3: Students operate laboratory facilities themselves to teach operation of laboratory equipment and perform data analysis (2b).

Objective 4: Design and planning of experiments and design of feedback control algorithms (2b, 11k).

Objective 5: Planning of laboratory work in a group of four students to promote coordination and communication between students (2b, 4d).

Objective 6: Discussion of professional and engineering ethics in lectures and laboratory environment (6f).

Objective 7: To provide students with experience in an engineering laboratory along with data analysis and modeling (2b, 11k).

Course Topics:

1. Operation of laboratory facilities
2. Data acquisition processes
3. Error analysis
4. Statistics
5. Report writing
6. Group coordination
7. Engineering ethics
8. Measurements on and analysis of fluid mechanic systems
9. Measurements on and analysis of solid mechanic systems
10. Measurements on vibration systems and analysis of feedback control systems

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Revised: R. de Callafon, April 2008 via Teaching Work Group Meetings
Reviewed and Revised: TWG, 2009, 2010, 2011
Reviewed: TWG, October 2012