

Process Dynamics and Control Laboratory Organization

The laboratory is equipped with a 4-tank experiment that demonstrates the main features of large-scale equipment in transient operation. The tank system is fully instrumented for measurement of relevant process variables such as liquid flow rates, levels, and power inputs. Matlab is used to regulate the power inputs to the pumps. Differential pressure sensors are used to measure the tank levels.

In addition, we have introduced a new experiment: the inverted pendulum. While the main physical principles are mechanical in nature, the control issues are common to both chemical and mechanical engineering, and include multivariable control, unstable systems stabilization, process modeling, and others.

At the end of the two-quarter ChE 152 sequence you should be familiar with procedures for obtaining theoretical and experimental process dynamics. You will also have gained practical experience with the design and implementation of feedback and feedforward controllers, and with on-line controller tuning techniques.

All of the experiments will be presented as typical "industrial assignments." It is crucial that each member of the lab group carefully read the lab handouts and prepare a "list of lab activities" *prior to the lab*. After the lab session, each group prepares a written lab report that must be submitted at the beginning of the next lab session. The format for the lab report is discussed below and in the "Guidelines for Writing Laboratory Memoranda" handout.

Lab Report Format

The lab report should consist of two separate portions: a memo and a "personal file." In writing memos the emphasis is on: (a) the logical and forceful presentation of your conclusions and recommendations; (b) the validity of your arguments backing up (a); and (c) the brevity and clarity of the memorandum. The memo should be organized as follows:

1. A short Introduction to the problem or assignment.
2. Conclusions and Recommendations.
3. A Discussion section which can include material on experimental method, main results, and supporting arguments.

As part of Item 3 you may submit no more than four plots and/or tables of data which you must refer to explicitly. No more than three typewritten pages (double spaced) should be required for the written portions of the memorandum. Each memorandum should include the important results of the experiment.

All additional calculations, derivations, proofs, raw data, working graphs, nomenclature, etc., ordinarily would remain in your *Personal File* for later reference.

Your personal file should be organized according to the file completeness list in the attachment. Since a personal reference file may need to be consulted several years after the original problem has been solved, reported, and largely forgotten, the personal file will be checked for accuracy, coherence, clarity and completeness. The grading policy for the personal files is shown in the enclosed "checklist."

It is important that the memo and personal file are written so that each can be read without referring to the other. Each lab group will be expected to turn in a memorandum and personal file for each experiment. Responsibility for writing up each experiment should be rotated within the group. Each person in the group is responsible for performing every experiment and for preparing each lab report. The "Guidelines for Writing Laboratory Memoranda" should be consulted for details.