New Mexico State University

Department of Chemical and Materials Engineering

CHE 422L – Unit Operations Laboratory

Fall 2014
Meets Tuesday/Thursday 1:10 to 3:50 p.m. in Jett Hall 171.

Catalog Description
Experiments with chemical engineering unit operations including the use of computer data acquisition and closed loop process control. Covers control system instrumentation, development of empirical models from process data, and PID controller design and tuning. Includes written and oral reports .

Prerequisites: CHE 307 and CHE 322L

Textbook: None. Experiment manuals are available on Canvas.

Course Objectives

1. Understand and apply engineering experimentation techniques and safety procedures common to the chemical industry.
2. Apply principles developed in chemical engineering courses to the analysis of chemical engineering processes and unit operations.
3. Improve technical writing skills.
4. Improve skills necessary for group work—interpersonal skills, coordination of the efforts of several persons, leader and subordinate roles, etc.

Instructor: Dr. Daniel Gulino; JH 171B; 575-646-1559 (office) or 740-517-2389 (cell, no later than 9 p.m.); gulino@nmsu.edu

Office hours: Tuesdays and Thursdays, 10:00 a.m. – 12:00 noon; other times by appointment.

Withdrawals
Students will not receive an automatic drop for persistent absences or failure to complete assignments. Responsibility for withdrawal is entirely the responsibility of the student.

Make-up Work
Late pre-lab or final report submissions will not be accepted.

Performance Evaluation

There are four experiments. Instructions for each are on Canvas. The reporting for each will consist of both pre-lab and final reports. In addition, each group will present one experiment report orally as shown on the schedule. The experiment for which your group delivers an oral report is the one your group performed last. Oral reports will be delivered the final week of the

semester according to the attached schedule. The location of the oral presentations will be JH 205 beginning at 2:35 p.m.

Grading expectations for pre-labs and final reports are attached. In other words, these lists show what I am expecting to find in your pre-lab and final reports, but I am not specifying a format. The structures of your reports are entirely up to you as a group as you decide how best to convey your findings and your interpretation of them.

Each team will submit a single report for each experiment, and final grades will be determined based on the scores on these reports weighted 40% pre-lab report and 60% final report. Oral presentations will be worth the same as one full experiment (100 points) and should be no more than 20-25 minutes in length. All members of the group must speak.

Pre-lab reports will likely be in the 3 to 6 page range in length, and final reports will likely be in the 4 to 8 page range in length. There is no required structure to the reports. Rather, as noted above, a description of pre-lab report expectations is attached, and it is up to the group to determine how best to organize and present that information.

	Points Per Experiment		Total
Pre-lab	40		160
Final Report	60		240
Oral Report	-------		100
Safety	5		20
Teamwork	5		20
		total for course	540

Grading scale: 90-100 A, 80-89 B, 70-79 C, 60-69 D, < 60 F.

How the Course will Operate

Please see the attached schedule. There are four experiments and six groups. Group memberships will be determined at the first class meeting. You will have a total of four lab periods to complete each experiment with each round beginning on a Thursday. How you use that time is up to you. The first of the four periods will be used for pre-lab meetings according to the attached schedule. More about this shortly.

The pre-lab report are due to the instructor three hours (by 10 a.m.) on the day of the lab period during which you plan to begin work.

Safety is of prime importance in this laboratory. Eye protection is mandatory the moment you enter the lab. While the experimental apparatus is generally well-behaved, you will at times be working with gases or liquids under pressure as well as at elevated temperatures. For the heat exchanger experiment in particular, steam is used as a heat source, and the exposed valves and pipes through which it passes can become hot enough to cause burns. Be careful before you touch something. Wear gloves. Be aware of the other experiments going on around you.

General Safety Rules:

1. Safety glasses with sideshields or safety goggles (when handling hazardous chemicals). Neckties, dangling clothing or jewelry, and other unsafe items are prohibited. Long pants are recommended.
2. Horseplay of any sort is absolutely prohibited in the laboratory.
3. Smoking and open flames are prohibited in the laboratory.
4. Safety precautions in the experimental plan must be followed.
5. No operating equipment will be left unattended. At least two members of the group must be present while the equipment is operating.
6. The laboratory floor must be kept dry, clean, and uncluttered at all times. Any spills should be cleaned up immediately.
7. Familiarity is expected with the safety aspects of all the chemicals used in the laboratory and with the coding system used to label containers and pipelines.
8. Any accident or hazardous situation must be reported to the teaching assistant or laboratory instructor immediately.

Prior to writing your pre-lab report for each experiment, your group is required to meet with the instructor in the lab to go over the experimental apparatus. These meetings are up to 15 minutes in length and take place according to the attached schedule. Note that the time of your group's pre-lab meeting depends on which experiment you are doing, not what group you're in.

Final reports for each experiment are due by 1 p.m. one week following the final scheduled lab period for that experiment.

Note on the schedule that you will have time off during the semester. You are not expected to attend the lab during your off weeks, but pay attention to the schedule so that you are ready for the next block in which you do have an experiment and when your next pre-lab meeting is.

Syllabus Addendum

Included by reference is the NMSU Department of Chemical and Materials Engineering Syllabus Addendum. It contains information regarding CHME Announcements, Attendance Policy, Student Accessibility Services, Academic Misconduct, Re-Grades, Student Work Products, Communication, FE Exam Reference Handbook, Video Surveillance, Computer Resources, Etiquette, Firearms, and Intervention. It may be accessed from the NMSU CHME home page under Academics, Syllabi or directly at http://chme.nmsu.edu/academics/syllabi/chme-common-syllabus-addendum/

Preparation date: August 21, 2014

Pre-Lab Report Expectations

1. Writing style is professional throughout, does not use jargon or casual or informal language or terms, uses the appropriate tense and "person" at all times, and reads as though written by one person.
2. There are no grammatical, spelling, or typographic errors. The level of English is at or above what would be expected from writers at the college level.
3. Figures, tables, references, and equations are properly displayed, formatted, labeled, and captioned as appropriate following standard conventions.
4. The experimental objective is clearly and concisely stated.
5. Experimental methodology is described in adequate detail including a test matrix or something similar if appropriate.
6. How the data is to be analyzed is clearly explained with sample calculations presented as appropriate.
7. Safety issues, including electrical, mechanical, and chemical hazards, are identified and addressed.

Final Report Expectations

1. Writing style is professional throughout, does not use jargon or casual or informal language or terms, uses the appropriate tense and "person" at all times, and reads as though written by one person.
2. There are no grammatical, spelling, or typographic errors. The level of English is at or above what would be expected from writers at the college level.
3. Figures, tables, references, and equations are properly displayed, formatted, labeled, and captions, as appropriate following standard conventions.
4. The experimental objective is clearly and concisely stated. At the conclusion of the report, discussion returns to the objective and addresses whether or not it was met.
5. Experimental methodology generally references the pre-lab with any changes or deviations from what was presented in the pre-lab report explained and justified.
6. Experimental results are clearly and concisely presented and appropriately quantitative versus qualitative.
7. Discussion includes comparison of results with expectations, sample calculations where appropriate, and an analysis of error.
8. Conclusions do not present results not already presented earlier in the report, address all areas of the experimental work, and address whether or not the objectives were met.

CHE 422L Course Schedule Fall 2014

	Group Number							
Date	1	2	3	4	5	6		
8/21	No Class Meeting							
8/26	Course Introduction - 2:35-3:50 p.m. - JH 205							
8/28	Exp 1	Exp 2	Exp 3	Exp 4	off		pre-lab meeting	
9/2							pre-lab report due by 10 a.m.	
9/4								
9/9								
9/11	Exp 3	Exp 4	off		Exp 1	Exp 2	pre-lab meeting	
9/16							pre-lab report due by 10 a.m.	final report due by 1 p.m.
9/18								
9/23								
9/25	off		Exp 1	Exp 2	Exp 3	Exp 4	pre-lab meeting	
9/30							pre-lab report due by 10 a.m.	final report due by 1 p.m.
10/2								
10/7								
10/9	Exp 2	Exp 1	Exp 4	Exp 3	off		pre-lab meeting	
10/14							pre-lab report due by 10 a.m.	final report due by 1 p.m.
10/16								
10/21								
10/23	Exp 4	Exp 3	off		Exp 2	Exp 1	pre-lab meeting	
10/28							pre-lab report due by 10 a.m.	final report due by 1 p.m.
10/30								
11/4								
11/6	off		Exp 2	Exp 1	Exp 4	Exp 3	pre-lab meeting	
11/11							pre-lab report due by 10 a.m.	final report due by 1 p.m.
11/13								
11/18								
11/20	No Class Meeting							
11/25	Thanksgiving							
11/27	Break							
12/2	oral	oral	oral	may attend orals			JH 205 - 2:35-3:50 p.m.	final report due by 1 p.m.
12/4	may attend orals			oral	oral	oral	JH 205 - 2:35-3:50 p.m.	

Pre-Lab Meeting Times:		
	Experiment 1 - Control of Interacting Tanks	1:15 p.m.
	Experiment 2 - Fixed/Fluidized Bed	1:30 p.m.
	Experiment 3 - Process Control	1:45 p.m.
	Experiment 4 - Gas Absorption Using a Packed Column	2:00 p.m.