

Prerequisites: ChEn 376, Engl 316, and Stat 201. You should also have completed ChEn 391 and ChEn 311. Please see the instructor if you have not completed <u>all five</u> of these classes.

Description: Experimental verification of unit operations design principles; data collection and reduction; report preparation.

Instructor:

Tom Fletcher; 330Q EB; 422-6236; tom_fletcher@byu.edu Michael Beliveau; 223 CB; 422-3921; beliveau@byu.edu (Lab Manager)

Teaching Assistants:

TBA

Objectives of Class

- 1. Perform experiments that reinforce concepts learned in the Chemical Engineering curricula. This semester focuses on fluid dynamics, heat transfer, and thermodynamics.
- 2. Experience more open-ended problem statements to simulate more of an industrial experience.
- 3. Improve skills in safety, group work, statistics, writing, and presentations.

Lab Format

We will meet in 393 CB for instruction before going to the lab, since there is a concurrent ChEn 477 course full of students in the lab. Please be courteous to the other students.

We will try to simulate a professional engineering environment in the lab. You will be divided into teams of three or four students and will be given three or four projects in the form of memos from your supervisor (instructor). The projects will intentionally be somewhat open-ended, and your team will respond to each project by conducting experiments, performing analyses, drawing conclusions, and making recommendations. Most of the projects are not merely cookbook experiments, and because of the intermediate size of the equipment may not work perfectly (which happens frequently in industry).

During the course of the class both written and oral reports will be used according to the class schedule. An electronic lab notebook will be required by the team for each project.

For the individual assignments, all graphs, figures, and tables must be your own work. You may not use figures from a team member for an individual report. For all projects, you will be required to maintain professional standards of attendance, teamwork, and safety practices throughout the semester.

Attendance

In keeping with the goal of simulating the professional environment, you must be in attendance ("at work") for the entire lab period on each day of the lab. <u>Each unexcused class missed will result in a 5 point deduction</u> from your grade unless you receive permission from your instructor and make up work that is agreeable with your group. Each unexcused tardy will result in a 2 point deduction. For emergencies or other pressing circumstances, please communicate with Mike Beliveau or Dr. Fletcher just as you would with an employer. If you focus on this class and analyze your data as you collect data, you should be able to perform all required work in the three-hour lab period.

Teamwork

You will be assigned to a different team for each project. It is expected that you will work cooperatively, sharing a fair portion of the work-load. At the conclusion of each project, the other members of your team will be required to evaluate how well you performed as a team member (attendance, abilities, contributions, demeanor, etc).

Safety

The following safety precautions are required by all (these are not optional):

- 1. No food is allowed in the laboratory or in the computer area. You may take a short break after the initial lecture time to eat or drink something, but not in the lab or computer area.
- 2. All personnel in the laboratory area are required to wear safety glasses, long pants, and covered shoes (no shorts, skirts, sandals, or flip-flops). You will lose points for preparation if you are not dressed properly on lab days, even if you only plan to work on the computer.
- 3. All students are required to complete ChEn 311 before taking ChEn 475; the ChEn 311 course includes the HAZCOM training course.
- 4. Experimental work should be completed during the regular class periods. If additional time is needed in the laboratory, you must clear it with your instructor and make an appointment for the use of the laboratory with Mike Beliveau. At least two students must be present during those additional hours (no one is permitted to work in the lab alone).

Resources

<u>Written Materials</u>: No official text is used for this course. Some textbooks and engineering handbooks are kept in the laboratory for your use, but please do not remove them from the room, and please return them to the bookshelf at the end of each period. A significant amount of information is also available on the course website at http://www.et.byu.edu/groups/uolab/. Of course, your textbooks from previous courses will also be helpful. YOU MAY NOT USE OR LOOK AT PREVIOUS REPORTS except those provided by the instructor.

<u>Hardware</u>: Instruments, supplies, manuals, etc., may be checked out from the Laboratory Supervisors, Mike Beliveau and Will Davis, or from the T.A. All materials checked out during the laboratory must be returned to the stockroom at the end of the laboratory period.

<u>Lectures</u>: Brief lectures will be given in 393 CB at the start of class in order to provide guidance about report writing, data analysis, etc. I hope that these will be helpful, and welcome your feedback on these lectures, as well as suggestions for additional topics.

Honesty

The honor code at BYU must be followed at all times. As previously stated, you must do your own work for the individual assignments. You may discuss data reduction, experimental results, etc. with your team (not previous teams unless given permission by the instructors) but you must write your own report and prepare your own graphs and figures for presenting your results. YOU MAY NOT USE OR LOOK AT PREVIOUS REPORTS except those provided by the instructor. Plagiarism and cheating is not tolerated in any profession, including chemical engineering. Plagiarism includes copying your partners work or copying reference material without proper references. If you need to include information in your report that is not your own, you should paraphrase the information and provide a reference. Academic dishonesty will result in a grade of E for the course.

Projects: Three projects will be given during the semester. The following outline gives some guidelines for the required reports. Additional details are provided in the supplemental handouts entitled "Experiments and Communication" and "Report Guidelines."

Item	#	Who?	Details
Safety Sheets	3	Team	Submit by the end of the second lab period for each project. You must have the
			form approved by an Instructor or TA prior to starting any experiments. You will
			hand-write the startup and shutdown procedures on the back of this form before it
			is approved.
Proposals	3	Team	Before any experimental work can begin, each team must submit a proposal outlining steps that will be followed to solve the problem.
Quizzes	3	Individual	A project-specific multiple choice quiz will be given at the conclusion of every project. These quizzes test basic understanding and should be easy to pass if the lab has been completed and each team member understands the equipment and analysis
Drograss	2	Individual	A 1 paragraph progress report and an accompanying 1 page powerpoint file
Reports	5	marviadai	describing intermediate results are required in the middle of the time for
Reports			experiments on each project.
Complete	1	Team	A complete report is required for the 1 st project, but limited to 4-5 pages.
Report			
Memo Report	1	Individual	A memo report is required for the 2 nd project, limited to 2-3 pages.
Grading	2	Individual	At the end of the 1 st and 2 nd projects, you will be required to critique reports from
critiques			two peers that are not on your team.
Oral	1	Team	Your team will be assigned to present an oral presentation for the 3 rd project.
Presentation			
Leadership	3	Individual	At the end of each lab, you will provide feedback to the members of your team
Report			about their performance as a teammate and leader.
Lab book	3	Team	The lab notebook will be electronic this year, using OneNote or MS Word. This
			must be completed each day and stored as a pdf file.

Grading

		Points	
1. In-class safety/lab assignment	Team	P/F	
2. Labview Assignment*	Team	P/F	
3. Leadership Report #1-3 (5 pts each)		15	
4. Progress Reports (10 pts each)		30	
5. Project #1 Team Complete Report [†]	Team	100	
6. Project #2 Individual Memo Report [†]		100	
7. Critiquing of Reports (4, 5 pts each)		20	
8. Project #1-3 Quizzes (30 pts each)		90	
9. Statistics Assignment*		20	
10. Statistics Quiz		20	
11. Projects #1-3 Team Proposals (30 pts each) [†]	Team	90	
12. Projects #1-3 Team Notebooks (10 pts for each project)	Team	30	
13. Project #3 Team Oral Presentation [†]	Team	100	
14. Attendance		*	
15. Attitude**		25	
TOTAL POINTS			

* This is an in-class assignment. Attendance and participation during the entire lab period is required since this exercise is part of the lab period. If you have to miss this class, please contact the instructor prior to the class to make arrangements for making up the assignment.

[†]Successful completion of these assignments is required to pass the class. An E grade will be given if one or more assignments is not submitted, or if a grade of 60% or less is given on any of these deliverables.

‡ Attendance is required. For each unexcused absence, 5 points will be deducted from the grade. For each tardy, 2 pts will be deducted from the grade.

**In the work place your attitude will play a large role in your evaluation by your supervisor. These points will be awarded by the instructor for maintaining a positive attitude in the class. Positive suggestions for improving the class are welcomed.

Grading will be on a curve, but the lowest grade given if a person attends class and completes all of the work is usually a B. If everyone works hard the average GPA should be around an A-.

Due Dates. All assignments must be turned in at the beginning of class to receive possible full credit. If late:

- 75% if turned in within 24 hrs (but class is not missed and report is not worked on in class)
- 60% if turned in within 24 hrs (but class is missed or report is worked on in class)
- 50% if turned in between 24 and 48 hrs
- 0% if turned in after 48 hrs.

Course Outcomes:

ABET Student Outcomes

- Students will be able to communicate effectively with a range of audiences.
- Students will function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- Students will be able to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

BYU Course Objectives

- Students will have a practical understanding of the function and use of pumps and valves and be able to make design decisions accordingly.
- Students will be able to design shell & tube heat exchangers to meet specific needs.
- Students will be able to perform design calculations for pumps, turbines, and/or compressors (e.g., involving ΔH , ΔS , work, heat, efficiencies).
- Students will understand the need for safe engineering practices; demonstrate knowledge of pertinent safety laws and regulations; understand and have a basic knowledge of how safety considerations are incorporated into engineering design.
- Students will be able to give effective, well-organized oral presentations to a technical audience.
- Students will be able to write effective, well-organized reports.
- Students will understand and commit to practice the AIChE code of ethics.
- Students will understand process variables (e.g., P, T, flow rate, conc.) including procedures and equipment for their measurement.
- Students will be able to operate a process control system and understand the components of such a system.
- Students will be able to explain and operate real process equipment.
- Students will understand basic engineering statistics.