Management of Unit Operations

ECH 4905/6905 Sections 2344, 258A, 2574

Class Days: Monday
Class Periods: 8 (3:00pm – 3:50pm)
Location: Virtual / Unit Operations Lab (CHE 100-300), ~~NRF for SM1 and SM2~~
Academic Term: Fall 2020

Instructor: Dr. LiLu Tian Funkenbusch
Office: CHE 219
E-mail: lilu.funkenbusch@ufl.edu
Office hours: Monday 9:00am-12:00pm or by appointment (Zoom link on Canvas)

Co-Instructor: Dr. Fernando Merida
E-mail: fmerida@ufl.edu
Office hours: Monday 11:00am-12:00pm or by appointment (Zoom link on Canvas)

Course Description: (1 - 3 credits) Supervised teaching and management of the Unit Operations Laboratory. Students taking his course will guide experiments of small groups of students, troubleshoot equipment problems, and perform a detailed analysis of the lab experiments.

Course Pre-Requisites: ECH 4424L (Unit Ops Lab I) and/or ECH4404L (Unit Ops Lab II)
Textbook: There is no required textbook for this class.

Recommended Literature

1. Geankoplis, C. J., *Transport Processes and Unit Operations* [On reserve in the Science Library].
2. Incropera, F. P. and D. P. DeWitt, *Fundamentals of Heat and Mass Transfer* [On reserve in the Science Library]
3. McCabe, W. L., J. C. Smith, and P. Harriet, *Unit Operations of Chemical Engineering* [On reserve in the Science Library]
4. Perry, R. H., D. W. Green, and J. O. Maloney, *Perry's Chemical Engineers' Handbook* [E-book is available through UF Library website]

Course Objectives

1. Ensure that students have a good understanding of the experiment prior to beginning the lab
    a. Review (but do not grade) pre-labs and preliminary calculations/predictions with the students
2. Supervise students as they conduct experiments in the Unit Ops Lab, including lab safety, theory, operating procedures, and troubleshooting
    a. 1 Credit: 1 lab session per week
    b. 2 Credits: 1 lab session per week plus a technical project
    c. 3 Credits: 2 lab sessions per week
3. Guide students to think and communicate as engineers
4. Participate in weekly meetings with the lab instructors, lab engineer, and other peer tutors
5. Work with the Unit Ops instructors and the Lab Engineer
    a. Improve experiments
    b. Troubleshoot technical problems
    c. Assess safety
    d. Revise SOPs and other documents

Professional Component (ABET):
The students taking this course will gain in-depth understanding of equipment used in Unit Operations of Chemical Engineering while reinforcing knowledge of safe operating procedures. In addition, the course provides opportunities to learn how to apply the fundamentals of Chemical Engineering to real-world systems while enhancing communication skills. Students will gain significant experience by leading a team and overall, teaching experience in a lab-based class.

Relation to Program Outcomes (ABET):

Outcome	**Coverage***
1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs	Medium
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
4. An ability to communicate effectively with a range of audiences.	High
5. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Medium
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	Medium
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	High

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not part of the course.

Canvas Website: http://elearning.ufl.edu/
The Unit Ops Lab Canvas sites contain descriptions of experiments, safety guidelines, and guidelines for writing reports. The Unit Ops Management Canvas site will be used for submission of student evaluations and posting of grades and announcements.

Experimental modules to be taught in Unit Ops I and II, and nomenclature:

Unit Ops I Modules:

- Thin Film Evaporator (TFE)
- Fluids (FLU)
  - Fluid flow in pipes (FF)
  - Small fluids experiments (SFE)
- Filtration (FIL)
  - Batch Filtration (BF)
  - Continuous Filtration (CF)
- Heat Exchanger & Fluidized Bed (H&B)
  - Heat Exchanger (HX)
  - Fluidized Bed (FB)

*UO1 Modules have changed for Fall 2020, Dr. Merida will provide further explanation to UO1 peer tutors

Unit Ops II Modules:

1. Batch Distillation (BD)
2. Continuous Distillation (CD)
3. Cooling Tower (CT)
4. Liquid-Liquid Extraction (LLE)
5. Semiconductor Module 1 (SM1)
   - Oxide Growth (SM1A)
   - Thermal Evaporation (SM1B)
6. Semiconductor Module 2 (SM2)
   - Photolithography (SM2A)
   - Wet & Dry Etching (SM2B)

* UO1 = 3 week rotation, UO2 = 2 week rotation

Attendance Policy, Class Expectations, and Make-Up Policy

Peer Tutors are required to attend all lab sessions. Excused absences must be consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation. **You must let us know as soon as possible**, so we can plan for someone else to cover your session. Unexcused absences and tardiness will result in a grade reduction. After 1 unexcused absence or 2nd tardiness, one grade of final score will be reduced, and another grade down for each additional tardiness.

Safety

Peer tutors are expected to know and follow safe operating procedures of the equipment as well as proper handling of hazardous materials. The students are required to complete the safety homework at the beginning of the semester. **Failure to follow safe operating procedures will result in a significant grade reduction.** Examples of safety violations are listed below (this list is not exhaustive):

Safety violation	**Penalty**
Leaving the lab without shutting down an experimental system	Failing grade
Not wearing PPE required by an experiment	Letter grade reduction
Not disposing of hazardous waste properly	Letter grade reduction
Not handling a chemical spill properly	Letter grade reduction
Causing a spill due to negligence (e.g., by opening wrong valves).	Letter grade reduction
Bringing food or drink into the lab	Letter grade reduction

***You** are responsible for your group's safety. Create a safe work culture and environment. Safety violations will affect their grade and yours.

Course Schedule

Week	Dates	Meeting Plan	Assignments Due
1	August 31st	• Introductions • Syllabus/grading policy review • **Online training**	• Safety homework • Experiment training *Unsatisfactory performance will lead to a grade penalty and a repeat session
2	Sept. 7th	• Typical daily procedure for lab • Proper pipette use	• Pre-lab and/or quiz solutions
3	Sept. 14th	• Safety & emergency procedures	• Online training transcripts
4	Sept. 21st	• Confidence & authority while teaching	• Student evaluations, Week 1
5	Sept. 28th	• Troubleshooting scenarios	• Student evaluations, Week 2
6	Oct. 5th	• Review/edit SOPs	• Student evaluations, Week 3
7	Oct. 12th	• Go over edited SOPs	• Student evaluations, Week 4
8	Oct. 19th	• Grade an old lab report	• Student evaluations, Week 5 • Edited or marked-up SOP
9	Oct. 26th	• Go over graded lab reports	• Student evaluations, Week 6
10	Nov. 2nd	• Review/edit Theory documents	• Student evaluations, Week 7 • Graded old lab report
11	Nov. 9th	• Go over edited Theory documents	• Student evaluations, Week 8
12	Nov. 16th	• Schedule for make-up labs	• Student evaluations, Week 9 • Edited or marked-up Theory documents
13	Nov. 23rd	Thanksgiving	n/a
14	Nov. 30th	• Term project presentations	• Student evaluations, Week 10
15	Dec. 7th	• Wrap-up • Suggestions for next semester	• Finding/training future peer tutors • Make-up sessions

*Evaluation dates match lab weeks, not semester weeks. Also, UO1 will only have evals due once per module, not once per week.

**We will also discuss any issues encountered in the lab during every meeting

Term Project Schedule

Week	Date	Assignment Details
2	Sept. 7th	Project topics announced
3	Sept. 14th	Peer tutors will meet w/ lab instructors to discuss their assigned project
5	Sept. 28th	Short proposal for the project, including the scope of the project, a preliminary timeline, possible resources from literature, and possible obstacles
9	Oct. 26th	Short progress report on the project, including completed work and a timeline/update on any remaining goals
12	Nov. 16th	First draft of project report due
15	December 7th	Final draft of project report due

Guidelines for Assignments

1. Guidelines and grading rubrics are posted on Canvas. Assignments will be graded on both technical content and communication effectiveness.
2. Any written assignments should be written using complete sentences, with correct spelling and grammar. All symbols should be defined on their first use. Clarity and brevity will be rewarded; sloppy thinking and writing will be penalized.
3. All reports should be submitted via e-learning either in Word or PDF format. No need to submit hard copies.
4. In addition to a report file, your submission should contain all supporting information, such as spreadsheet files with your data and files with your computer codes. However, your reports should be self-contained, i.e. one should be able to understand your work by reading your report without referring to supporting materials.
5. **Late submissions will be penalized by a 10% grade reduction for each day the assignment is overdue.**

Evaluation of Grades

The grade will be determined according to the following weighting criteria:

Teaching Only:

Assignment	**Worth**
Safety Homework	25 pts
Pre-Lab/Quiz Solutions	25 pts
Attendance to all required training sessions and meetings	50 pts
Online training	25 pts
Student evaluations	25 pts each (UO2) / 75 pts each (UO1)
Edited SOP	25 pts
Graded old lab report	25 pts
Edited Theory documents	25 pts

Teaching + Project:

Assignment	**Worth**
Project proposal	20 pts
Progress report	30 pts
First draft of full report	50 pts
Final draft of full report	100 pts

Grading Policy

Percent	**Grade**	**Grade Points**
94.0 – 100.0	A	4.00
90.0 – 93.9	A-	3.67
87.0 – 89.9	B+	3.33
84.0 – 86.9	B	3.00
80.0 – 83.9	B-	2.67
77.0 – 79.9	C+	2.33
74.0 – 76.9	C	2.00
70.0 – 73.9	C-	1.67
67.0 – 69.9	D+	1.33
64.0 – 66.9	D	1.00
60.0 – 63.9	D-	0.67
0.0 – 59.9	E	0.00

More information on UF grading policy at: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

COVID-19

We will have face-to-face instructional sessions to accomplish the student learning objectives of this course and ECH4404L. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution and not being allowed into the lab.
- This lab has enough capacity to maintain physical distancing requirements. Please maintain appropriate spacing when possible. Experiments may require temporarily being closer to maintain chemical/physical safety.
- Sanitizing supplies (hand sanitizer, wipes, etc.) are available in the lab. We use these supplies between course session to wipe down common touch surfaces.
- Only enter and exit the lab on the appropriate floor through the main set of doors. Practice physical distancing to the extent possible when entering and exiting the lab. You should sanitize or wash your hands before and after coming to the lab.
- If you are experiencing COVID-19 symptoms (Click here for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.
- With an excused absence, you will be given a reasonable amount of time to make up work. The earlier you let us know, the earlier we can find someone to substitute or make arrangements with the students.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Cooperation Policy

- Students are expected to work in teams on their experiments and memos.
- Pre-lab and post-lab homework should be answered by each student individually.
- No consultation among students is allowed during quizzes.

Plagiarism

Students are not permitted to represent as their own work any portion of the work of another person. Plagiarism includes (but is not limited to) submitting a document or assignment which in whole or in part is identical or substantially identical to a document or assignment not authored by the student. **All sources used in preparation of the reports should be cited.**

Falsification of Information

Students are not permitted to use or report any invented or fabricated information or data. This includes both experimental results and theoretical calculations.

Sanctions for Violations of Honor Code

Since ethical behavior in science and engineering is equal in importance to specific knowledge, the instructor will assign a *non-passing letter grade* to students who violate academic honesty standards, regardless of the violator's grade performance in class.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect, regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.