

## Management of Unit Operations

EGN 6905 Section 67GH

**Class Periods:** W Period 7 (1:55 – 2:45 PM)

**Location:** TBD

**Academic Term:** Spring 2024

**Instructor:** Dr. Fernando Mérida

- Email: [fmerida@ufl.edu](mailto:fmerida@ufl.edu)
- Office Hours: Virtual Only\* (link [here](#))  
M 11:00am – 12:00 pm, or by appointment
- You can call me Prof./Dr. Mérida, or “Fernando” if you feel comfortable doing so.

**Instructor:** Dr. LiLu Tian Funkenbusch

- Email: [lilu.funkenbusch@ufl.edu](mailto:lilu.funkenbusch@ufl.edu)
- Office hours: \*Virtual Only (link [here](#))\*  
T 11am-12:30pm and R 11:30am-1pm
- Please call me Prof./Dr. Funkenbusch or LiLu. Please do not call me Ms. or Mrs. Funkenbusch

### **Contacting course instructors:**

- E-mail is the preferred communication platform. Please make sure the subject line of your e-mail message has the label “UOM - Question”. You should expect a response within 48 hours (M-F) and 72 hours (weekend).
- Announcements will be posted on Canvas. All students must sign up to receive Canvas notifications.

### **Course Description:**

3 credits. Student instruction, experiment supervision, and management of the Chemical Engineering Unit Operations Laboratory for undergraduate students.

**Course Pre-Requisites / Co-Requisites:** Instructor permission

### **Course Objectives:**

This course will introduce students to supervision and management of bench- and pilot-plant scale unit operations typical within the chemical industry. Students taking this course will guide experiments of small groups of undergraduate students, troubleshoot equipment problems, and perform a detailed analysis of the lab experiments. The goal is to provide students with fundamentals of lab management and the solid operating principles of unit operations by assisting undergraduate students during experiments thus fostering troubleshooting, decision making, safety, and other management-oriented skills.

### **Lab Assistant ('peer tutor') Responsibilities:**

- Have a good understanding of both the fundamentals and technical operating principles of the operation of the assigned experiment(s).
- Provide undergraduate students taking either of the Unit Operation Labs (ECH4224L or ECH4404L) with a good understanding of the operating principles prior to conducting the experiment.
- Supervise undergraduate students in the execution of experiments, helping them conduct experiments safely and troubleshooting when problems arise.
- Review (but not grade) progress reports, calculations, and preliminary analysis with the undergraduate students thus helping them with data analysis.
- Guide undergraduate students to think and communicate as engineers.
- Participate in weekly meetings (outside of the schedule of experiments) with the course instructors, lab engineer, and other lab assistants with the objectives of discussing the progress and improvement of experiments, troubleshooting technical problems, assessing safety issues, revising standard operating procedures (SOPs) and other technical documents. The first meetings of the semester are extremely important as students will be provided with effective teaching practices, right before they start assisting students with experiments.

**Recommended Materials**

- Geankoplis, C. J., Transport Processes and Unit Operations [On reserve, Science Library].
- Incropera, F. P. and D. P. DeWitt, Fundamentals of Heat and Mass Transfer [On reserve, Science Library]
- Gerhart, Philip M., Gerhart, Andrew L., and Hochstein, John I, Munson's Fluid Mechanics [On reserve in the Science Library]
- McCabe, W. L., J. C. Smith, and P. Harriet, Unit Operations of Chemical Engineering [On reserve, Science Library]
- Perry, R. H., D. W. Green, and J. O. Maloney, Perry's Chemical Engineers' Handbook [E-book available through UF Library website]

**Table of experimental modules\* to be taught in ECH4224L: Unit Operations I and ECH4404L: Unit Operations 2 and experiment abbreviation:**

Unit Operations 1 (UO1)	Unit Operations 2 (UO2)
<ol style="list-style-type: none"><li>1. Thin Film Evaporator (TFE)</li><li>2. Fluid Flow (FLU)</li><li>3. Flow Characteristic Curves (CUR)</li><li>4. Filtration (FIL)</li><li>5. Heat Exchangers (HEX)</li><li>6. Fixed and Fluidized Bed Columns (BED)</li></ol>	<ol style="list-style-type: none"><li>1. Batch Distillation (BD)</li><li>2. Continuous Distillation (CD)</li><li>3. Cooling Tower (CT)</li><li>4. Liquid-Liquid Extraction (LLE)</li><li>5. Semiconductor Module 1 (SM1)<ul style="list-style-type: none"><li>○ Oxide Growth (SM1A)</li><li>○ Photolithography (SM1B)</li></ul></li><li>6. Semiconductor Module 2 (SM2)<ul style="list-style-type: none"><li>○ Wet &amp; Dry Etching (SM2A)</li><li>○ Thermal Evaporation (SM2B)</li></ul></li></ol>

\* UO1 and UO2 have a 2-week module rotation

### Course Schedule

The course schedule is summarized below. Modifications to the schedule may be required due to repair/maintenance of equipment, atmospheric phenomena (e.g., hurricane), or other reasons not listed in this document. Announcements will be posted on Canvas regarding any modification of the course schedule.

### Course and assignment schedule\*

Week	Dates	Meeting Plan <sup>†</sup>	Assignment
1	JAN 08 - 12	<b>No meeting</b> (experimental trainings)	First-Week Paperwork (experiment trainings, online trainings, GatorTRACS hazard assessment)
2	JAN 15 - 19	Introduction, class info and policies, and overview of UO1 & UO2 schedule	- HW-1: General Safety - First-Week Paperwork (extended deadline for UO1 peer tutors only)
3	JAN 22 - 26	Safety, basic routines in experiments, and emergency shutdown procedures	
4	JAN 29 – FEB 02	<b>No meeting</b> (Career Showcase)	
5	FEB 05 - 09	- Review of preliminary calculations and student evaluations - Review of proper pipette use Safety II, Emergency Shutdown Procedures, and Troubleshooting 1	
6	FEB 12 - 16	Confidence, authority, and ethics	HW-2: Confidence, authority, and ethics
7	FEB 19 - 23	Troubleshooting and experiment checkup	
8	FEB 26 – MAR 01	Internship, Co-Op, and REU experiences: applicability to experiment instruction	
9	MAR 04 - 08	Lab manual review: theory	HW-3: Theory edits
10	MAR 11 - 15	<b>No meeting</b> (Spring Break)	
11	MAR 18 - 22	Lab manual review: SOP	HW-4: SOP edits
12	MAR 25 - 29	Professional communication in the UOL	
13	APR 01 - 05	Former peer tutor stories	
14	APR 08 - 12	Term Project Presentations	HW-5: suggested peer-tutors
15	APR 15 -19	Management wrap-up and suggestions for future semesters	
16	APR 22 - 24	<b>No meeting</b>	HW-6: Training of new peer tutors

\* This schedule is subject to change. Canvas announcements will be posted by course instructors in case modifications to this schedule are required.

<sup>†</sup> In addition to topics listed in the Meeting Plan, we will also discuss any issues encountered in the lab in every meeting.



### ***Homework, due dates, format, and policies***

Instructions to prepare assignments will be available on Canvas. Assignment deadlines will be Fridays until 11:59pm via Canvas according to the table above; students must check the course schedule available in the Canvas Home Page for any adjustment or modification throughout the semester. Additional instructions will be given via Canvas announcements or by e-mail. A brief description of assignments is provided below.

### ***Assignment description***

- **FIRST-WEEK PAPERWORK:** this is a set of four individual activities as described below:
  - **Experiment Training:** peer tutors will be trained in their corresponding experiments by course instructors of ECH4224L and ECH4404L (or former peer tutors). This in-person training will be offered during the first week of the semester.
  - **Online training (FERPA and EH&S):** Peer tutors must complete online trainings required by EH&S and the College of Engineering. There are three required trainings: **a) UF\_PRV802\_OLT–FERPA Basics, b) UF\_EHS869\_OLT–Chem Hygiene Plan (1.4), and c) UF\_EHS809\_OLT–Hazardous Waste Management (1.3).** These are available via “My Training” via MyUFL and must be completed before experiments start. Evidence of completion or training transcripts must be submitted to the course instructor.
    - ❖ **In-Person HF Safety Training (EH&S):** Students supervising experiments located in the Nanoscale Research Facility (the SM sequence of UO2) must complete an in-person HF safety training course with EH&S.
  - **GatorTRACS hazard assessment:** peer tutors must update their information in GatorTRACS and subsequently review & sign the hazard assessment of the Unit Operations Lab via LATCH (more details will be provided in the first meeting)
    - ❖ *Note: students cannot start as lab assistants if the assignments above have not been completed.*
  - **HW-1 - General Safety:** this assignment deals with general lab safety in the Unit Operations Laboratory as well as safety guidelines in assigned experiment(s). It must be completed before experiments start.
  - **HW-2 - Confidence, Authority, and Ethics:** This assignment includes a list of questions and study cases to assess the relevance of confidence and authority by peer-tutors, along with ethical dilemmas.
  - **HW-3 and HW-4 - Edited Theory and SOP:** These assignments aim to review lab manuals used in Unit Operations experiments to identify strengths and potential improvements. Peer tutors will use a Word version of the lab manual to add comments, changes, or suggestions to improve the quality of lab manuals in sections such as theory and standard operating procedures (SOP).
  - **HW-5 - Identification of prospective peer-tutors:** This assignment deals with the identification of prospective peer tutors for subsequent semesters, including strengths and potential challenges, based on student evaluations and interactions in the lab.
  - **HW-6 - Training of new peer tutors:** Once new peer tutors have been selected, training of new peer tutors will be coordinated with course instructors.

*Please note the following guidelines regarding assignments:*

1. Guidelines and rubrics are available on Canvas.
2. Written assignments should be prepared 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 assignments, forms, and evaluations should be submitted via Canvas either in Word or PDF format. No need to submit hard copies unless otherwise stated. Grading of assignments will primarily be done on a complete/incomplete basis.

4. Any assignment with more than five days overdue will result in a “warning notification” for the student. If after three days of this notification the assignment is still overdue, the student will receive a letter grade reduction.

**Student evaluations and qualitative rubrics**

In addition to assignments described above, peer tutors will periodically evaluate the performance of supervised students in experiments via student evaluation forms submitted to course instructors via Canvas. Qualitative rubrics may also be used to evaluate the progress of data analysis, calculations, and preliminary results of supervised students. Peer tutors will submit these rubrics to course instructors.

- Student Evaluations: Peer tutors will qualitatively rate the participation and involvement of supervised students in the lab. Rubrics (available in Canvas and prepared by course instructors of ECH4224L and ECH4404L) will be submitted via Canvas at the end of week 2 for each rotation (**no later than Friday**)
- Preliminary Calculations (PR) -UO1 peer tutors only: Peer tutors will qualitatively rate the preliminary calculations, predictions, and other data analysis elements performed by supervised students. Rubrics (available in Canvas and prepared by the course instructor of ECH4224L) will be submitted via Canvas at the end of week 1 for each rotation (**no later than Friday**)

**Attendance Policy, Class Expectations, and Make-Up Policy**

- Attendance is described as follows:
  - Weekly meeting: students are required to attend (see excused absences)
  - Experimental sessions: in their role as peer-tutors, students are required to attend all tutored experimental sessions depending on credit enrollment: 1 lab session per week for students registered with 1 credit, 2 lab sessions per week (two different days) for students registered with 3 credits.
- 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. **Students must let course instructors know as soon as possible** so we can plan for someone else to cover your session.
  - Arrangements between peer-tutors of different sections are possible, but they must be discussed with the course instructor.
- Tardiness will result in a grade reduction (unless there is a valid excuse, and they are notified to the course instructor in a reasonable time window). First tardiness will result in a “warning” for the student. After a 2<sup>nd</sup> tardiness, one grade of final score will be reduced, a 3<sup>rd</sup> tardiness an additional grade of final score will be reduced. A 4<sup>th</sup> tardiness will result in failure in the class.

**Evaluation of Grades**

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

Criteria	% Final Grade
Experimental Training	5%
EH&S, FERPA, and LATCH Assessment	5%
Performance in tutored lab sessions (12)	45%
Student Evaluations (6) & and PR Rubrics* (6)	15%
Homework <sup>†</sup> (6)	20%
Weekly Meeting Attendance	10%
Final Grade	100%

\* UO1 peer-tutors only

† See Homework table (HW-1 – HW-6)

*Important: Grades for assignments and class activities as described in the tables above will be posted on Canvas. However, the final grade will be computed outside Canvas to avoid incorrect weighing observed in Canvas gradebooks.*

### **Grading Policy**

Percent	Grade	Grade points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

[UF Graduate Catalog](#)  
[Grades and Grading Policies](#)

### **Safety**

Lab assistants are expected to know and follow safe operating procedures of equipment, devices, and materials used in experiments, 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 safety guidelines during experiments will lead to significant grade reductions.** Examples of safety violations are listed below (this list is not exhaustive).

#### *Examples of safety violations*

Safety violation	Penalty
Leaving the lab without proper shutting down	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 major spill due to negligence	Letter grade reduction
Eating or drinking inside the classroom	Letter grade reduction
Using non-intrinsically safe/non-explosion proof electronic devices in areas restricting the use of electronics	Letter grade reduction

*\*As a lab assistant, you are responsible for your group's safety. It is expected that peer-tutors create a safe work culture and environment. Safety violations will affect the grades of the group and that of the peer-tutor.*

### **Lab assistants/peer-tutor Evaluations**

Students taking unit operations lab classes (ECH4224L or ECH4404L) will evaluate the performance of peer tutors at the end of each module. These evaluations will be anonymously submitted via Canvas to the course instructor. Subsequently, the course instructor will compile and process these evaluations and will send it to peer tutors upon request. Even though

the evaluations provided by students to peer tutors are not part of their grade, peer tutors are expected to demonstrate responsibility and professionalism during their teaching activities, maintaining and fostering a respectful environment, and avoiding biased behaviors. Grade reductions can be applied in case of overall poor performance by the peer tutor.

### ***Students Requiring Accommodations***

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.afl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.afl.edu/public-results/>.

### ***In-Class Recording***

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### ***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://sccr.dso.ufl.edu/process/student-conduct-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.



### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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
- HWCOE Human Resources, 352-392-0904, [student-support-hr@eng.ufl.edu](mailto:student-support-hr@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***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: <https://registrar.ufl.edu/ferpa.html>

### ***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](mailto: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:** <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

#### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

#### **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 support**, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.  
<https://iss.at.ufl.edu/help.shtml>.

**Career Connections Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

**On-Line Students Complaints**: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.