

Management of Unit Operations

(UOM)

ECH 4905/6905 Sections: 2344, 258A, 2574

- **Class meeting time:** Mon (3:00 – 3:50 pm)
- **Location:** CHE 237
Zoom link: <https://ufl.zoom.us/j/95471495535?pwd=bThiKzFsai9MMklMZUVHbzYvUGZuUT09>
Passcode: 847264
- **Academic Term:** Spring 2021

Instructor: Dr. Fernando Mérida

- e-mail: fmerida@ufl.edu
- Office hours: By appointment
<https://ufl.zoom.us/j/95471495535?pwd=bThiKzFsai9MMklMZUVHbzYvUGZuUT09>
- You can call me Prof./Dr. Mérida, or “Fernando” if you feel comfortable by doing it so.

Co-Instructor: Dr. LiLu Tian Funkenbusch

- e-mail: lilu.funkenbusch@ufl.edu
- Office hours: By appointment
- Please call me Prof./Dr. Funkenbusch.

Course platform and meeting information:

This course will be face-to-face (F2F) for this term. Additionally, a simultaneous Zoom meeting will be available for students who are unable to attend the in-person class for various reasons. For technical issues regarding the use of Zoom and/or Canvas please visit the [help desk website](#) or call 352-392-4357. Zoom meetings will require the use of audio and video. Please check the section Student Privacy regarding recorded materials.

Contacting course instructors:

- E-mail and Canvas messages are the preferred communication platforms for this class. Make sure the subject line of your message has the label “UOM - Question” You should expect a response within 48 hours (M-F) and within 72 hours (weekend).
- Announcements will be periodically posted on Canvas. All students must signed-up to receive notifications for Canvas announcement during the term.

Additional point persons:

- Lab Engineer: Mr. Preston Towns, ptowns@che.ufl.edu CHE118

Course Description

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

Course Pre-Requisites

Undergraduate sections: ECH 4424L (Unit Ops Lab I) and/or ECH4404L (Unit Ops Lab II)

Graduate section: No pre-requisite.

Course Objectives

1. Ensure that students taking Unit Ops 1 and 2 have a good understanding of the experiment prior to beginning the lab
 - a. Review (but do not grade) progress reports, calculations, and preliminary analysis with the students.
2. Supervise students as they conduct experiments in Unit Ops Lab classes, 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 engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors | Medium |
| 3. An ability to communicate effectively with a range of audiences | High |
| 4. 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 |
| 5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives | High |
| 6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions | High |
| 7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies | Medium |

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

Course websites

- **Canvas website:** <http://elearning.ufl.edu/>

Canvas will be used as the main repository of information and other resources for the supervision of experiments, assignment preparation, safety guidelines, etc. It will also be used for submission of participation, posting of grades, announcements, and general information for the class.

Recommended Literature:

There is no required textbook for this class. The following titles are recommended to support fundamentals and theoretical background, physical constants, empirical correlations, and other concepts:

1. Geankoplis, C. J., *Transport Processes and Unit Operations* [On reserve in the Science Library].

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

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

| Unit Operations 1 (UO1) | Unit Operations 2 (UO2) |
|---|---|
| <ol style="list-style-type: none"> 1. Fluid Flow (FLU) 2. Flow Characteristic Curves (CUR) 3. Flow through Packed Beds (BED) 4. Heat Exchangers (HEX) | <ol style="list-style-type: none"> 1. Batch Distillation (BD) 2. Continuous Distillation (CD) 3. Cooling Tower (CT) 4. Liquid-Liquid Extraction (LLE) 5. Semiconductor Module 1 (SM1) <ul style="list-style-type: none"> ○ Oxide Growth (SM1A) ○ Thermal Evaporation (SM1B) 6. Semiconductor Module 2 (SM2) <ul style="list-style-type: none"> ○ Photolithography (SM2A) ○ Wet & Dry Etching (SM2B) |

* UO1 = 3-week module rotation; UO2 = 2-week module rotation

Course schedule

The course schedule is summarized below. Modifications to the schedule might be required depending on the progress of experiments which could be affected by performance of equipment/instrumentation, class cancellation due to atmospheric phenomena (e.g. hurricane season), or other reasons not listed in this document. Announcements will be posted in Canvas regarding any modification of the course schedule.

Course schedule for ECH 4905/6905

| Week | Dates | Meeting Plan | Assignments due this day* |
|------|----------------------|---|--|
| 1 | Jan 11 th | <ul style="list-style-type: none"> • Introduction (Online) • Overview of UO1 platform and schedule • Syllabus/grading policy review • COVID-19 guidelines | |
| 2 | Jan 18 th | <ul style="list-style-type: none"> • Discussion of ideas for setup week • Typical procedures for F2F and online UO1 sections • Safety & Emergency procedures | |
| 3 | Jan 25 th | <ul style="list-style-type: none"> • Review of setup week • FLU: preparation, ideas, & and module timeline | Confidence & authority while teaching |
| 4 | Feb 1 st | <ul style="list-style-type: none"> • Troubleshooting scenarios • Review of FLU calculations | FLU-PR Rubric** |
| 5 | Feb 8 th | <ul style="list-style-type: none"> • FLU wrap up • Go over reviews/edits of FLU lab manuals | Reviews/edits FLU Lab Manual |
| 6 | Feb 15 th | <ul style="list-style-type: none"> • CUR: preparation, ideas, & and module timeline. • Potential pitfalls & troubleshooting | Student participation forms: FLU |
| 7 | Feb 22 nd | <ul style="list-style-type: none"> • Discussion of system curves • Review of CUR calculations | CUR-PR Rubric |
| 8 | Mar 1 st | <ul style="list-style-type: none"> • CUR wrap up • Go over reviews/edits of CUR lab manuals | Reviews/edits CUR Lab Manual |
| 9 | Mar 8 th | MID-TERM BREAK (no class) | Student participation forms: CUR |
| 10 | Mar 15 th | <ul style="list-style-type: none"> • BED: preparation, ideas, & and module timeline • Potential pitfalls & troubleshooting | |
| 11 | Mar 22 nd | <ul style="list-style-type: none"> • BED calculations • How to grade a lab report | BED-PR Rubric |
| 12 | Mar 29 th | <ul style="list-style-type: none"> • BED wrap up • Go over reviews/edits of CUR lab manuals | Reviews/edits BED Lab Manual |
| 13 | Apr 5 th | <ul style="list-style-type: none"> • HEX: preparation, ideas, & and module timeline • Potential pitfalls & troubleshooting | Student participation forms: BED |
| 14 | Apr 12 th | <ul style="list-style-type: none"> • HEX calculations | HEX-PR Rubric |
| 15 | Apr 19 th | <ul style="list-style-type: none"> • HEX wrap up • Go over reviews/edits of CUR lab manuals • Suggestions for next semester | <ul style="list-style-type: none"> • Reviews/edits BED Lab Manual • Student participation forms: HEX |

* Assignments will be submitted via Canvas. The deadline is before the class time.

** Deadline for submission of PR Evaluation Rubrics will be the day of the tutored session.

Term Project Schedule (for students with 2-credits)

| Date | Details |
|----------------------|--|
| Jan 18 th | Project topics announced |
| Jan 25 th | The student will meet with lab instructors to discuss the assigned project |
| Feb 8 th | Short proposal for the project, including the scope of the project, a preliminary timeline, possible resources from literature, and possible obstacles |
| Mar 8 th | Short progress report on the project, including completed work and a timeline/update on any remaining goals |
| Mar 29 th | First draft of project report due |
| Apr 19 th | 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 assignments/reports should be submitted via Canvas 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 (if applies). 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.**

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

F2F Course Policy in Response to COVID-19

- Complete a screening questionnaire via ONE.UF, book a COVID-19 test with UF Health, and get tested before the first day of in-campus classes. Regular screening and testing will be required for students in F2F classes throughout the semester. You can access this information [here](#).
- Students are required to wear approved face coverings at all times during classes and within buildings.
- Physical distancing must be kept at all times. Our class has a maximum capacity this semester to meet the appropriate physical distancing requirements established by UF. There might be moments during meetings when close proximity for very small time periods will be required, but they will be kept to a minimum.
- Hand sanitizer is available in the classroom door and students are highly encouraged to bring a pocket size hand sanitizer with them.
- **Upon entering the classroom, students must sanitize their hands keeping appropriate physical distancing. This will be done at the beginning of each class.**
- **If you are experiencing COVID-19 symptoms or have been in close proximity to someone infected with the virus, please use the UF Health screening system immediately and follow the instructions on whether you are able to attend class (see below).**
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. [Find more information in the university attendance policies](#).. Grades will not be affected as long as the student inform the course instructor in a reasonable timeframe.

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

COVID-19 is an obvious factor in the attendance policy, but arrangements can be made if you are ill. Please read the section above corresponding to F2F Course Policy in response to COVID-19

- Peer Tutors are required to attend all tutored experimental 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. Students must let the course instructor know as soon as possible, so we can plan for someone else to cover your session. Arrangements between peer-tutors of other sections are possible, but they must be discussed with the course instructor. Unexcused absences/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.

What should I do if someone I live with or have frequent contact with tests positive or starts showing symptoms? What should I do if I test positive or start showing symptoms?

-Prepared by Dr. LiLu Funkenbusch-

1. First and foremost, stay home. Do not come to the classroom and put others at risk.
2. File a report with UF Screen, Test, and Protect (STP). Arrange to get tested and/or plan to quarantine. This will change your status to “not cleared” to return to campus. **You may not come into the lab without at least one negative test result after your symptoms are gone or after the full 2-week quarantine period.** Either one of these should change your “not cleared” status back to “cleared”. We cannot mandate testing, but you will not be allowed back into the building without “cleared” status.
3. Tell me and your group. You do not need to provide full details (and I legally cannot obligate you to share medical information) but let everyone who needs to know that you won't be in lab for at least one week. Hopefully, you either are not sick or have a mild/asymptomatic case and can still help your group with data analysis/report writing, but whatever the case, we will make it work.
4. Finally, make sure that you follow up with UF for the contact tracing / quarantine interview.

Following and enforcing these policies are all our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution, the revocation of lab/building access, and grade penalties, up to and including failing the course.

Evaluation of Grades

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

Teaching Only

| Assignment | % Final Grade |
|---|----------------------|
| Confidence/Authority | 5% |
| Progress Report Evaluation Rubrics | 20% |
| Training/Refresher Sessions | 15% |
| Completion of Student Participation Forms (4) | 20% |
| Edited Lab Manuals (4) | 30% |
| Graded old report | 10% |
| Final Grade | 100% |

Teaching + Term Project

| Assignment | % Final Grade |
|---|----------------------|
| Confidence/Authority | 5% |
| Progress Report Evaluation Rubrics | 20% |
| Training/Refresher Sessions | 15% |
| Completion of Student Participation Forms (4) | 20% |
| Term Project | |
| • Project Proposal | 5% |
| • Progress Report | 10% |
| • First Draft of Full Report | 10% |
| • Final Draft of Full Report | 15% |
| Final Grade | 100% |

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 |

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

| Assignment | % Final Grade |
|---|---------------|
| Confidence/Authority | 5% |
| Progress Report Evaluation Rubrics | 20% |
| Training/Refresher Sessions | 15% |
| Completion of Student Participation Forms (4) | 20% |
| Edited Lab Manuals (4) | 30% |
| Graded old report | 10% |
| Final Grade | 100% |

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Safety

Peer-tutors are expected to know and follow safe operating procedures of devices and materials used in experiments. The students are required to attend an orientation session at the beginning of the semester that will include general safety guidelines for experiments. **Failure to follow safety guidelines 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 handling/cleaning material spill properly | Letter grade reduction |
| Causing a major spill due to negligence | Letter grade reduction |
| Eating or drinking inside the classroom | Letter grade reduction |

Use, care, and return of experimental kits:

- Each peer-tutor is responsible for the good use of elements included in the experimental kit. Instructions will be clearly stated in lab manuals and other documents to avoid damage to kit components and enforced in classes and training/refresher sessions. Unintentional damage or malfunctioning of kit components might occur so student must notify peer-tutors and course instructor if this happens.
- **Students must return some of the kit components at the end of the semester.** Instructions will be given on what are the specific components to be returned and the logistics for kit return.
- **Failure to return kit materials will result in a failing grade of the course.**

Peer-tutor Evaluations

Students of Unit Ops classes will evaluate the performance of peer-tutors at the end of each module. These evaluations will be anonymous and 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 ratings/evaluations provided by students to peer-tutors are not part of the grade, peer-tutors are expected to demonstrate responsibility and professionalism during their teaching activities, keeping 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 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 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.aa.ufl.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.aa.ufl.edu/public-results/>.

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/policies/student-honor-code-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 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

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, Online Course Recording, and Video/Image Sharing

- 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>
- The online section will require the use of audio and video for the purposes of conducting experiments remotely. Some portions of these classes might be audio visually recorded as a reference for students that were not able to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who unmute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

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 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

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://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>.