

Fluid and Energy Transfer Operations Laboratory

(Unit Operations Lab 1)

ECH 4224L

Sections: 2775 (Wednesday), and 2G31 (Thursday)

Class Periods: 2 - 5 (8:30 am – 12:35 pm)

Locations: Unit Operations Lab (CHE 100, 200, 300), and CHE 220

Academic Term: Fall 2021

Instructor:

Dr. Fernando Mérida

You can call me Prof./Dr. Mérida, or Fernando if you feel comfortable by doing it so. Remember that calling your instructors by their names must encompass the same level of professionalism and respect than using professional titles.

- **e-mail:** fmerida@ufl.edu
- **Office Hours:** Mondays, 9:00 – 11:00 am via Zoom (Meeting ID, link, and password available in Canvas)

Contacting Dr. Mérida:

- E-mail and Canvas messages are the primary communication platform. Make sure the subject line of your message has the label “ECH 4224L -Day- Question” (“day” refers to your day/section; you can use the first three letters of the day that corresponds to your section. 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 be signed-up to receive Canvas notifications during the term.

Peer-Tutors:

- Please use “peer-tutor” for undergraduate students assisting in experiments. Avoid the use of “TA” since this title refers to a graduate student in a completely different role.
- Contact peer-tutors through the Canvas message or via e-mail (see Table 1). Modifications in the list below may be required and will be announced through Canvas if necessary.

Table 1. Peer-tutors for Unit Ops 1

Module	Wed	Thu
TFE (Thin Film Evaporator)	Jason Kantorow jkantorow@ufl.edu	Garret Kost gkost@ufl.edu
FLU (Fluid Flow)	Alex LoCurto locurtoalex@ufl.edu	Mandi Chen mandi.chen@ufl.edu
CUR (Flow Character. Curves)	Carina Burton carina.burton@ufl.edu	David Padron d.padron@ufl.edu
FIL (Filtration)	David Padron d.padron@ufl.edu	Coleman Korsog colemankorsog@ufl.edu
HEX (Heat Exchangers)	Sophia Kvachneva skvachneva@ufl.edu	Sophia Kvachneva skvachneva@ufl.edu
BED (Fixed/Fluidized Bed Columns)	Sophia Kvachneva skvachneva@ufl.edu	Melina Michel melina.michel@ufl.edu

Additional point persons:

- Lab Engineer: Mr. Preston Towns, ptowns@che.ufl.edu
- Unit Ops 2 course instructor: Dr. LiLu Funkenbusch, lilu.funkenbusch@ufl.edu

Course Description

(2 credits) Experimental work in fundamentals of Unit Operations involving heat and momentum transfer.

Course Pre-Requisites

ECH 3101 (Process Thermodynamics), ECH 3203 (Fluid and Solid Operations), ECH 3223 (Energy Transfer Operations), ENC 3246 (Professional Communication for Engineers)

Course Co-Requisites

ECH 4714L (Safety and Experimental Evaluation)

Materials and Supply Fees: \$100.24

Course Objectives

1. Reinforce classroom theory by the collection and use of data in practical experiments with all their inherent problems and limitations.
2. Gain proficiency in writing technical reports and/or oral presentations.
3. Gain experience in working in teams.
4. Create a sense of professional responsibility for the quality and integrity of engineering work.
5. Learn the importance of working under Safety guidelines thus promoting a safe environment for others.
6. Learn equipment, instrumentation, and procedures not covered in lectures
7. Learn and apply basic concepts of statistical analysis and Design of Experiments whenever is possible.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex 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	
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	Low
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 preparation of experiments, submission of reports, projects, and other assignments. It will also be used for posting of grades, announcements, and general information for the class. Please note that due to the inability of Canvas to properly weigh assignments with special points or bonus given to assignments, final grades will be computed externally by the Course Instructor.
- **CATME**
This software will be used for two purposes: a) group formation, and b) peer-member evaluations. Additional instructions are available in Canvas.

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]

Course overview

- The course consists of six experimental modules, and each module lasts for two weeks. This two-week period will be called *rotation*.
- Each course section is divided into groups of four students and the groups will *rotate* through all six modules. A few groups may have either 3 members only, or a fifth member depending on final enrollment at the end of the add/drop period.
- **Regardless of individual contributions, each team member is responsible for understanding all elements of each experiment including theory, experimental design, system configuration, experimental protocol, etc. in the different modules.**

Groups

Group formation will be performed via CATME's team building algorithms according to instructor-determined criteria, aiming to optimize the student team composition thus making groups more diverse, heterogenous, and having similar meeting times outside the class. Groups will be formed within the first week of the semester.

Module description

The six modules are subdivided into different experiments that will be conducted within the two-week period corresponding to each module rotation. Groups will complete six rotations across the six modules throughout the semester. Names and nomenclature for experimental modules are provided below.

- **TFE:** Thin Film Evaporator
- **FLU:** Fluid Flow
- **CUR:** Flow Characterization Curves
- **FIL:** Filtration
- **HEX:** Heat Exchangers
- **BED:** Fixed and Fluidized Bed Columns

Course schedule

Schedule is summarized in Table 2 using the nomenclature previously defined. Modifications to the schedule may 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.

Table 2. Course schedule for ECH 4224L, Spring 2021

Schedule		Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Rotation 1	Aug 30 - Sep 3	TFE	FLU	CUR	FIL	HEX	BED
	Sep 6 - Sep 10						
Rotation 2	Sep 13 - Sep 17	FLU	CUR	FIL	HEX	BED	TFE
	Sep 20 - Sep 24						
Rotation 3	Sep 27 - Oct 1*	CUR	FIL	HEX	BED	TFE	FLU
	Oct 4 - Oct 8						
Rotation 4	Oct 11 - Oct 15	FIL	HEX	BED	TFE	FLU	CUR
	Oct 18 - Oct 22						
Rotation 5	Oct 25 - Oct 29	HEX	BED	TFE	FLU	CUR	FIL
	Nov 1 - Nov 5						
Rotation 6	Nov 8 - Nov 12**	BED	TFE	FLU	CUR	FIL	HEX
	Nov 15 - Nov 19						

*Career showcase week; classes are held.

**Veterans Holiday (Thu 11/11); No classes.

Experiment Distribution per module						
	TFE	FLU	CUR	FIL	HEX	BED
Week 1	Feed Rate	Mini fluidic	Pilot Pump	Batch	Low-Th	Fixed
	Pressure	Pilot Pipe	Small Pumps	Continuous	High-Th	Fluidized
Week 2						

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

- **Students are required to attend all lab sessions.** This includes on-campus and online meetings (if any), depending on the individual student's rotation schedule.
- In case of foreseeing an absence due to justifiable reasons (excused absences) such as job interview, medical appointments, etc., the student must notify the course instructor (with copy to the peer-tutor whenever is possible) no later than the day before the missed class.
- In case of unexpected situations or emergencies, the student must notify the course instructor (and peer-tutor if possible), and teammates no later than 10:00 am the day of the corresponding class. Failure to notify the course instructor will result in unexcused absence.
 - Keep in mind that the course instructor will file a UMatter WeCare report in case the student does not notify the absence by 10 am, just to make sure that the student is safe.
- 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.
- Unexcused absences and tardiness will result in grade reductions as follows:
 - **One unexcused absence will result in a 10% grade reduction. A second unexcused absence will result in a failing grade in the course.**

- Tardiness of > 10 minutes after the class starting time without appropriate notification to the course instructor or the team members will cause a missed quizz. In case of an uncontrollable situation or emergency, the student must notify team members and course instructor as soon as possible.
- A second case of tardiness without appropriate notification will result in a 10% overall grade reduction in the course.
- A third case of tardiness will result in a failing grade in the course.
- Making up a lab: Any missed lab (excused or unexcused) must be made up. Dates for make up labs will be announced but you should expect they happen towards the end of the semester (e.g., last two weeks of the semester). Specific dates must be coordinated with the course instructor. Keep in mind that making up a lab will not remove any grade deduction or penalty associated with the absence.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Evaluation of Grades

Table 3. Grade distribution

Assignment	% Final Grade
Quizzes (6)	5%
Pre-Labs (6)	10%
Progress Reports (6)	15%
Final Reports (5)	55%
Presentation (1)	10%
Participation*	5%
Final Grade	100%

*Participation grade will be a combination of: a) peer-tutor feedback and course instructor's observations for each module, b) completion of evaluations for peer-tutors, team evaluations in CATME, and other surveys. **Participation less than 2.5% will result in a failing course grade.**

Important: Grades for assignments and class activities as described in Table 3 will be posted in Canvas. However, the final grade will be computed outside Canvas to avoid incorrect weighing frequently observed in Canvas gradebooks.

Grading Policy

Table 4. 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:

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

Safety

Students are expected to know and follow safe operating procedures of devices and materials used in experiments as well as proper handling of hazardous materials. Students are required to attend an orientation & safety session at the beginning of the semester (first day of classes). **Failure to follow safety guidelines will result in significant grade reductions.** Examples of safety violations are listed below (this list is not exhaustive).

Table 5. 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 handling/cleaning a chemical spill properly, or not disposing of hazardous waste properly	Letter grade reduction
Causing a major spill due to negligence	Letter grade reduction
Eating or drinking in the lab	Letter grade reduction
Using non-intrinsically safe/non-explosion proof electronic devices in areas restricting the use of electronics	Letter grade reduction

Homework, due dates, format, and policies:

Instructions to prepare all assignments will be available in Canvas. Due dates are specified below; students must check the course schedule available in the Canvas Home Page for specific dates during throughout the semester. Additional instructions will be given via announcements in Canvas or via e-mail.

- **Quizzes:** *Format: Hard copy; individual.* Quizzes will be given in the lab before each new lab session (i.e., every week). Quizzes might be rescheduled for students who cannot take them due to an acceptable reason (see the attendance policy). The student should notify the instructor about the situation as soon as possible to allow adequate time to find an alternative time. Quizzes are closed book/manuals/supporting materials and students may not communicate with anyone else while taking the quiz.
- **Pre-Lab Homework (PL):** *Format: Typed, PDF or Word file; individual assignment submitted via Canvas.* Each student must prepare an assignment dealing with fundamentals/theory behind the experiment, potential experimental scenarios, Engineering assumptions, etc. Materials required for the preparation of PL are included but not restricted to lab manuals. Pre-lab homework may be discussed during the class time with peer-tutors and course instructor via questions to students. Students will not be allowed to start experiments if the assignment was not submitted. This assignment is due the night before a new module begins (11:59 pm). Late submissions will be accepted only if a student was not able to complete the homework on time due to an acceptable reason (see the attendance policy).
- **Progress Reports (PR):** *Format: Typed, Word or PDF, and Excel spreadsheet; group assignment submitted via Canvas.* Students must work on a short progress report summarizing the work done so far, preliminary results, sample calculations, and next steps. Specific details and guidelines will be available in Canvas. All of the other sections must be typed. This assignment will be discussed with peer-tutors and/or course instructor during class, and it is due by 11:59 pm before week 2 of each module. Keep in mind that discussion of progress reports may require to check your electronic calculations thus submission of Excel file is along with the report is required. Late submissions will be accepted only if a group was not able to complete the homework on time due to an acceptable reason (see the attendance policy).
- **Final Reports (FR):** *Format: Typed, Word or PDF, and updated Excel spreadsheet; group assignment submitted via Canvas.* Modules for the first five rotations require the submission of a final report with results shown in a concise yet professional, organized fashion. This assignment is due one week after experiments for the module have been finished. For example, if you are in the Wednesday section and completed all experiments on the second week for the ongoing module, your group will have until next Wednesday at 11:59 pm to submit the FR. Late submissions will be accepted only if a group was not able to complete the homework on time due to an acceptable reason (see the attendance policy).
- **Presentation:** *Format: Group, oral presentation using a PowerPoint slide show; ppt and updated files must be submitted via Canvas; group assignment.* For the last module rotation of the semester, each group will deliver a presentation to talk about the results of the module (e.g., rather than submitting a FR). Presentations will be delivered during the class time (unless otherwise stated) one week after finishing the module. Each group must submit the ppt and Excel files no later than 11:59 pm the day of the presentation. Specific details on presentation sections, time duration, classroom, etc. will be available via Canvas. Late submissions or absence during presentation will not be accepted (unless there is an acceptable reason).

Keep in mind the following...

- Report contents, guidelines for report preparation, presentation sections, and grading rubrics will be available in Canvas. Reports and presentation will be graded on both technical content and communication effectiveness.
- Reports should be written using professional writing elements and appropriate formatting. Appropriate formatting (e.g., tables, figures, diagrams, and other) is of utmost importance both for reports and presentation.
- **Participation:** students will be evaluated *individually* for participation in the class. Participation active involvement in experiments (answers to questions, experimental skills, initiative, suggestions/ideas during experiments, etc.) In addition, participation includes the completion (on time) of peer-tutor evaluations (via Canvas) and peer-member evaluations via (CATME). Elements affecting participation grade include tardiness, lack of preparation, disrespectful behavior, lack of commitment, lack of submission of evaluations, and other not listed in this document.

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/>.

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.

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

Cooperation Policy

- Students are expected to work in teams on their experiments and for the preparation of reports.
- Individual assignments, such pre-labs should be completed 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, including the manuals provided on the Canvas webpage. Failure to do so is considered plagiarism.

Note: Self-plagiarism is also an issue and will be punished as if the student plagiarized someone else's work. You must cite any figures or information taken from other reports. This is the academic standard and is largely due to journal copyright issues when publishing papers.

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.

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.

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.

Writing Requirement

This course confers 6000 words towards the Writing Requirement (WR), which ensures students both maintain their fluency in writing and use writing as a tool to facilitate learning. While helping students meet the broad learning outcomes of content, communication, and critical thinking, the instructor will evaluate and provide feedback on students' written assignments with respect to grammar, punctuation, clarity, coherence, and organization.

Course grades have two components. To receive Writing Requirement credit, a student must receive a grade of C or higher and a satisfactory completion of the writing component of the course.

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 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/>.

COVID-19

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

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>.