

Elementary Transport Phenomena

ECH 3264 Sections 12384 and 12385

Class Periods: Online

Academic Term: Fall 2020

Instructor:

Prof. Jaime Benitez

Adjunct Lecturer, Chemical Engineering Department, University of Florida

Office: Black Hall Room 418

jaime.benitez@ufl.edu

Office Phone Number

Office Hours: To be announced

Web site: UF course CANVAS web site

Teaching Assistants:

Please contact through the Canvas website

- None

Course Description

Flux law and conservation equations of mass, energy, and momentum; steady and unsteady states as applied to physical and chemical processing; macroscopic and microscopic analysis. 3 credit hours

Course Pre-Requisites / Co-Requisites

Pre-requisites: ECH 3012, MAP 2302 and MAC 2313.

Course Objectives

Upon completion of this course the student will be able to:

1. Derive differential equations from basic conservation principles describing heat, mass, and momentum transfer.
2. Define and utilize Fourier's Law and Fick's Law.
3. Define the characteristics of Newtonian and Non-Newtonian Fluids.
4. Define and explain the origins of the physical quantities used to describe heat, momentum, and mass transport (such as heat-transfer coefficient, viscosity, and diffusivity).
5. Use the equations of change to formulate differential equations with proper boundary conditions to describe transport phenomena.
6. Solve one-dimensional steady state problems of mass, momentum, and heat transport with and without source terms.
7. Solve selected multidimensional problems of mass, momentum, and heat transport with and without source terms.

Materials and Supply Fees

N/A

Professional Component (ABET):

The course provides 3 credits towards the *Engineering Topics* professional component of the Curriculum Criterion of the ABET Criteria for Accrediting Engineering Programs.

Relation to Program Outcomes (ABET):

The following ABET Outcomes are assessed in this course.

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.	Low
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	
4. An ability to communicate effectively with a range of audiences	
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.	Low
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	

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

Required Textbooks and Software

- Title: Introductory Transport Phenomena
- Authors: Bird, Stewart, Lightfoot, and Klingenberg
- Publication date and edition: Wiley 2015, 1st Edition
- ISBN number: 978-1-118-77552-3

Recommended Materials

N/A

Course Schedule

Week 1:	The Subject of Transport Phenomena	Chapter 0
Week 2:	Mechanisms of Energy Transport	Chapter 9
Week 3:	Shell Energy Balances	Chapter 10
Week 4;	Problems with Two Independent Variables	Chapter 11

Week 5:	Temperature Distributions in Turbulent Flow	Chapter 12
Week 6:	Dimensional Analysis	Chapter 13
Week 7:	Mechanisms of Momentum Transfer	Chapter 1
Week 8:	Shell Momentum Balances	Chapter 2
Week 9:	Equations of Change	Chapter 3
Week 10:	Velocity Distributions in Turbulent Flow	Chapter 4
Week 11:	Macroscopic Balances	Chapter 7
Week 12:	Non-Newtonian Liquids	Chapter 8
Week 13:	Diffusivity and the Mechanisms of Mass Transfer	Chapter 17
Week 14:	Shell Mass Balances	Chapter 18
Week 15:	The Equations of Change for Binary Mixtures	Chapter 19
Week 16:	Concentration Distributions in Turbulent Flow	Chapter 20

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.

Attendance Policy, Class Expectations, and Make-Up Policy

- Class attendance is not required.
- Dates and format of Exams 1 and 2 will be announced at least 2 weeks in advance.
- Requests for make-up exams will be considered only for those students who missed due to an acceptable reason (illness, family emergencies, military obligation, religious holidays, participation in official university activities, etc.) as listed in the undergraduate catalog.

Evaluation of Grades

Assignment	Percentage of Final Grade
Homework Sets	20%
Exam 1	25%
Exam 2	25%
Final Exam	30%
	100%

Grading Policy

Percent	Grade	Grade Points
90.0 - 100	A	4.00
89.0 - 89.9	A-	3.67
86.7 - 88.9	B+	3.33
80.0 - 86.6	B	3.00

79.0 – 79.9	B–	2.67
76.7 - 78.9	C+	2.33
70.0 - 76.6	C	2.00
69.0 – 69.9	C–	1.67
66.7 – 68.9	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>

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/>.

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.

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@ufl.edu
-

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

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 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>.