

Energy Transfer Operations

ECH 3223 Sections 12704 and 12705

Class Periods: T, Periods 2-3, (8:30 AM – 10:25 AM); R, Period 2 (8:30 AM – 9:20 AM)

Location: FLG 0230

Academic Term: Fall 2019

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

Steady state conduction in solids and heterogeneous materials, transient conduction, convection heat transfer, heat transfer during boiling and condensation, radiation heat transfer, design of heat-transfer equipment and heat exchange networks. 3 credit hours

Course Pre-Requisites / Co-Requisites

All students should have successfully passed Computer Model Formulation (COT 3502) and Elementary Transport Phenomena (ECH 3264).

Course Objectives

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

1. Explain the basis of heat transfer including Newton's law of cooling, Fourier's law, and concepts concerning heat transfer coefficients and dimensionless numbers.
2. Derive a mathematical description of heat transfer problems using shell balances in Cartesian, cylindrical, and spherical coordinates.
3. Solve unsteady and multi-dimensional heat transfer problems using the knowledge of the equations of change and knowing how to perform separation of variables and/or similarity transformations.
4. Design heat exchanger networks and evaporators.

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.	High
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.	Medium
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	Medium
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	

*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: Fundamentals of Heat and Mass Transfer
- Authors: Bergman and Lavine
- Publication date and edition: Wiley 2017, 8th Edition
- ISBN number: 9781119320432

Recommended Materials

N/A

Course Schedule

Week 1:	Introduction/ General heat diffusion equation	Chapters 1 & 2
Week 2:	General heat diffusion equation and boundary conditions	Chapters 1 & 2
Week 3:	One-dimension steady-state heat diffusion/Thermal resistance	Chapter 3
Week 4;	Fins	Chapter 3

Week 5:	Fins	Chapter 3
Week 6:	Two-dimensional steady-state conduction	Chapter 4
Week 7:	Two-dimensional steady-state conduction	Chapter 4
Week 8:	Two-dimensional steady-state conduction	Chapter 4
Week 9:	No class (Spring Break)	
Week 10:	Transient conduction	Chapter 5
Week 11:	Transient conduction	Chapter 5
Week 12:	Convection	Chapters 6 & 7
Week 13:	Internal/External flow	Chapters 7 & 8
Week 14:	Boiling and condensation	Chapter 10
Week 15:	Heat exchangers	Chapter 11
Week 16:	Heat exchangers	Chapter 11

Attendance Policy, Class Expectations, and Make-Up Policy

- Attendance of lectures is highly recommended, but not required.
- Exams 1 and 2 will take place during normally scheduled class periods. Dates and format of exams 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
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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>.