Energy Transfer Operations

ECH 3223 Section 4221 (Class Number: 11422)
Class Periods: Monday / Wednesday / Friday, Period 2 (8:30am-9:20am)
Location: RNK 110
Academic Term: Fall 2025

Instructor:
Travis J. Anderson, Ph.D.
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205G Particle Science & Technology (PST)
Office Hours: Monday / Wednesday 3:00pm-4:00pm, PST Lobby, or by appointment

Supervised Teaching (ST) Student:
Hubert Treve,
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Office Hours: Wednesday 1:00pm-2:00pm, PST Lobby, or by appointment

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

Course Pre-Requisites / Co-Requisites
COT 3502 and ECH 3264

Course Objectives
(1) Knowledge of the basics of heat transfer including Newton's law of cooling, Fourier's law, and concepts concerning heat transfer coefficients and dimensionless numbers
(2) Derivation of a mathematical description of heat transfer problems using shell balances or heat diffusion equation in Cartesian, cylindrical, and spherical coordinates
(3) Be able to 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) Learn how to design heat exchanger networks and evaporators

Materials and Supply Fees
N/A

Relation to Program Outcomes (ABET):

Outcome	**Coverage***
1. An ability to identify, formulate, and solve complex 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	High
3. An ability to communicate effectively with a range of audiences	

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	
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	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

Required Textbooks and Software

- T.L. Bergman, A.S. Lavine, F.P. Incopera, D.R. DeWitt, *Fundamentals of Heat and Mass Transfer* , 8th Edition, Wiley 2018, ISBN 978-1-119-35388-1
  Note: The 7th edition covers the same material, but the book problems are numbered differently.

- Python
- Microsoft Office

Helpful Reference Materials

- Bird, Stewart, Lightfoot, *Transport Phenomena,* 2nd Ed, Wiley (2002)
- Welty, Wicks, and Wilson, *Fundamentals of Momentum, Heat, and Mass Transfer,* 4th Ed, Wiley (2000)

Required Computer

UF student computing requirement: *https://news.it.ufl.edu/education/student-computing-requirements-for-uf/*

Course Schedule

The course will proceed according to the following ***tentative*** schedule. Updates will be posted as necessary.

Week 1:	Intro / General Heat Diffusion Equation and Methodologies	Chapter 1
Week 2:	Thermal Resistance and Boundary Conditions	Chapter 2
Week 3:	1D Conduction	Chapter 3
Week 4:	Fins	Chapter 3
Week 5:	Transient Conduction	Chapter 5
Week 6:	Transient Conduction	Chapter 5
Week 7:	2D Conduction	Chapter 4
Week 8:	2D Conduction	Chapter 4
Week 9:	Convection	Chapter 6
Week 10:	External Flow	Chapter 7
Week 11:	Internal Flow	Chapter 8
Week 12:	Boiling & Condensation	Chapter 10
Week 13:	Heat Exchangers	Chapter 11
Week 14:	Heat Exchangers	Chapter 11
Week 15:	Review	

Attendance Policy, Class Expectations, and Make-Up Policy

- Class attendance is strongly recommended, but not required.
- Requests for make-up exams will be considered only for those students who missed due to an acceptable reason as listed in the undergraduate catalog (link below). For all planned or unplanned absences, the student should inform the instructor as soon as possible according to the guidelines in the undergraduate catalog (link below). Requests for make-up tests will be granted only if appropriate documentation is provided.
- Students arriving late for an exam will be given only the balance of time remaining to complete their work unless an acceptable reason is provided (see Academic Resources link).

Homework

- Homework will be assigned approximately every 2 weeks
- Solutions will be posted on the course website
- Homework must be turned in at the beginning of class on the due date
- No late homework will be accepted after the solutions are posted

Exams and Quizzes

- There will be 2 midterm exams during the semester and a final exam. The exam dates will be announced at least 2 weeks in advance.
- There will be 3 quizzes during the semester. The dates will be announced at least 1 week in advance.
- The Final Exam is December 11, 2025 07:30AM-9:30AM. The final exam is scheduled by the Registrar.

Evaluation of Grades

Assignment	**Percentage of Final Grade**
Homework Sets	10%
Computer Project	5%
Quizzes (3)	15%
Midterm 1	20%
Midterm 2	20%
Final Exam	30%
	100%

Grading Policy

The grading scale for the course will be as follows:

Percent	**Grade**	**Grade Points**
90.0 - 100	A	4.00
85.0 - 89.9	A-	3.67
80.0 - 84.9	B+	3.33
75.0 - 79.9	B	3.00
70.0 - 74.9	B-	2.67
65.0 - 69.9	C+	2.33
60.0 - 64.9	C	2.00
55.0 - 59.9	C-	1.67
50.0 - 54.9	D+	1.33
45.0 - 49.9	D	1.00
40.0 - 44.9	D-	0.67
0 – 39.9	E	0.00

Instructor may employ a curve only to lower the threshold for attaining the letter grades specified above.

Academic Policies & Resources

Click here to access information on Academic Policies & Resources: https://go.ufl.edu/syllabuspolicies