

Energy Transfer Operations

ECH 3223 Class Number: 12383

Class Periods: M,W,F | Period 4 (10:40 AM - 11:30 AM)

Location: TBA

Academic Term: Fall 2020

Instructor:

Dr. Sergey Vasenkov

Professor

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Office Hours: each Wednesday between TBA

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Supervised Teaching (ST) student:

Ms. Julie Jameson

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Office hours: each Thursday between TBA

Grader:

TBA

Course Description

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

ZOOM will be used for live lectures and office hours. Lecture notes and recorded live lectures will be made available to all students in the class. If the incidence of coronavirus improves during the Fall term, the University may require that this course becomes face-to-face course simply by assigning a meeting room. Given the current incidence of the virus, we cannot count on that happening, but the option to convert to face-to-face is there throughout the Fall semester.

Our class meetings will 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 ask your questions during regular office hours, which will not be recorded. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Course Pre-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 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

Professional Component (ABET):

Course objectives (1), (2) and (3) are linked to program outcome 1. Course objectives (4) is linked to program outcome 2.

Assessed 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

Required Textbook

T.L. Bergman, A.S. Lavine, F.P. Incropera, and D.P. DeWitt
Fundamentals of Heat and Mass Transfer
7th Edition, John Wiley & Sons, 2011
ISBN : 978-0-470-50197-9

Tentative Course Schedule

- Week 1: General heat diffusion equation and boundary conditions / pages 82-91
- Week 2: General heat diffusion equation and boundary conditions / pages 82-91
- Week 3: Thermal resistance / pages 112-119 and 136-143
- Week 4: Fins / pages 156-161
- Week 5: Fins / pages 156-161
- Week 6: Two dimensional steady-state conduction (analytical approach) / pages 230-235
- Week 7: Two dimensional steady-state conduction (finite-difference method) / pages 241-250
- Week 8: Two dimensional steady-state conduction (finite-difference method) / pages 241-250
- Week 9: Transient heat conduction (lumped capacitance method) / pages 280-290
- Week 10: Transient heat conduction (exact solutions) / pages 298-320
- Week 11: Transient heat conduction (exact solutions) / pages 298-320
- Week 12: Introduction to convection / pages 378-401 and 407-409
- Week 13: Internal flows / pages 518-539
- Week 14: Condensation on a vertical plate / pages 675-679
- Week 15: Heat exchangers / pages 711-714 and 722-732
- Week 16: Heat exchangers / pages 733-746

Attendance Policy, Class Expectations, and Make-Up Policy

Class attendance is strongly recommended. Excused absences are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation. Requests for make-up tests will be granted only if appropriate documentation about illness, family emergency or UF-related travel are given to the Instructor.

Exams and Quizzes: There will be 2 exams during the semester and a final exam. The midterm exams are scheduled for TBA. There will be 4-5 announced quizzes during the semester. Quizzes will be announced at least 1 week in advance. No credit will be given for problems that have a solution but all the work leading to this solution is not shown. Partial credit will be assigned based on the rules that will be consistently applied to all students.

For all quizzes in this class the following rules will be applied: During a quiz you can use the textbook for this class. However, you cannot use homework solutions, lecture notes or any other materials.

For all exams in this class the following rules will be applied: For each exam you can prepare one page with the expressions of your choice. You can use both sides of the page. No other materials are allowed, except for the handouts given by the Instructor for the exam (if any).

- Homework:
1. Homework will be assigned approximately once a week.
 2. Solutions will be posted on the course website.
 3. The homework must be turned in at the beginning of class on the due date.
 4. Late homework will be accepted only with instructor approval. As a rule, there will be a 20% penalty for each day it is late. No late homework accepted after the solutions are posted.
 5. No credit will be given for problems that have a solution but all the work leading to this solution is not shown.
 6. The following format has to be used:
 - a. The student's name should be written on the front page.
 - b. Begin each problem on a new page.
 - c. Write only on one side of a page.
 - d. All pages must be stapled.
 - e. Underline all intermediate answers. Box all final answers.

Evaluation of Grades

Assignment	Total Points	Contribution to Final Grade
Homework Sets (10-13) (at least one set will require using Python)	10 each	10%*
Quizzes (4-5)	10 each	30%*
Exam 1	10	20%
Exam 2	10	20%
Final Exam	10	20%
Total		100%

* When calculating the total score for all quizzes and its contribution to the final grade the score of one quiz, which represents the lowest quiz score for any particular student, will be removed and not taken into account. It is expected that each student will have the total score larger than 50% for all homework assignments during the semester. Similarly, the total score larger than 35% is expected for all quizzes during the semester. A failing grade will be assigned to students if the total score for all homework assignments and/or the total score for all quizzes are smaller than 50% and 35%, respectively. In each homework assignment only one randomly selected problem will be graded. Instructor will make the problem selection. The assignment(s) requiring the use of Python will contribute 20% to the total homework credit, while the assignments requiring analytical solutions will contribute the remaining 80%.

Grading Policy

The grades will not be curved.

Percent	Grade
100 - 90	A
89.9 - 85.0	A-

84.9 - 80.0	B+
79.9 - 75.0	B
74.9 - 70.0	B-
69.9 - 65.0	C+
65.9 - 58.0	C
57.9 - 50.0	C-
49.9 - 45.0	D+
44.9 - 40.0	D
39.9 - 35.0	D-
34.9 - 0	E

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>

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

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>.