

EML4140 Heat Transfer

Spring 2020

Lecture: Period 4: TUE. 10:40 AM -11:30 AM. WEIL 0270
Period 4-5: THUR. 10:40 AM - 12:35 PM. WEIL 0270

Instructor: Dr. Jing Pan
MAE-B RM 224
Email: jingpan@ufl.edu
Phone: 352-294-6869

TA: Meisam Habibi Matin, Email: mhabibi@ufl.edu
Morteza Alipanahrostami, Email: morteza.alipanah@ufl.edu
Heaba Nouredine, Email: heaba.nouredine@ufl.edu
Shan He, Email: shanhe0824@ufl.edu

Office Hours:

Monday: Morteza, 1 ~ 5 PM, NEB RM 109
Tuesday: Jing, 11:30 AM ~ 12:30 PM, 1:30 ~ 3:30PM, MAE-B RM 224
Wednesday: Heaba, 10 ~ 11 AM, 2 ~ 3 PM MAE-B RM 237
Thursday: Meisam, 1 ~ 5 PM, NEB RM 109
Friday: Shan, 1 ~ 3 PM, NEB RM 109

Prereqs: MAP 2302 with minimum grade of C, EAS 4101, EGN 3353C, EML 3100, EGM 4313

Textbook: Fundamentals of Heat and Mass Transfer, 8th ed., by T.L. Bergman, A.S. Lavine, F.P. Incropera, and D.P. DeWitt

Website: <https://ufl.instructure.com/>

Course Objectives:

EML4140 serves to introduce the student to the many different processes by which heat may be transferred. A list of the specific topics is provided in the Course Schedule. In covering this material, there should be three overriding objectives:

(a) The student should appreciate the physical origins of the various heat transport mechanisms. Moreover, when confronted with a particular problem, (s)he should be able to identify the relevant transport processes.

(b) The student should be able to perform engineering calculations for problems involving heat transfer. (S)he should know when, and of what nature, simplifying approximations may be made. (S)he should also be able to perform the kinds of calculations which lead to a rational design and/or an improved understanding of the performance of thermal exchange systems.

(c) A final, yet equally important objective, is to develop a positive attitude towards the subject of heat transfer. It is incumbent upon the instructor to reveal the vital role which such processes play in the natural and industrial worlds and to thereby transmit a sense of excitement for the subject.

The student should leave the course with confidence in his/her understanding of, and ability to apply, the basic principles. (S)he should also leave with a desire to apply what (s)he has learned and to expand upon his/her background.

Attendance:

Regular class attendance is expected and encouraged. Each student is responsible for all of the material presented in class and announcements made in class. Exams will emphasize materials covered in lectures.

Assignments:

Reading: The instructor will only highlight the materials corresponding to a particular period. You are expected to do the reading before the scheduled lecture.

Homework: Weekly homework assignments will be posted online every Wednesday midnight and will be due the following Saturday midnight (11:59pm). All assignments should be submitted through Canvas. No email or hard copy submissions will be accepted. All problem solutions and grades will be posted on Canvas. There will be in total 12 homework assignments and the lowest score will be dropped. You should follow example format in solving all homework problems. Show all work, clearly mark answers, and be neat.

Late submission: Delays in submissions are highly discouraged. Late submissions will be accepted till Sunday midnight and 20% points are deducted. Only exceptions are rare instances (medical or family emergencies) with pre-approval by Dr. Pan.

Exams:

Midterm 1 – Feb. 6th in class, 10:40am to 12:00pm;
Midterm 2 – Mar. 19th in class, 10:40am to 12:00pm;
Final Exam – Apr. 30th in WEIL 0270, 7:30am to 9:30am;

Exam policy: Exams are open book and open notes. Laptop and tablet are allowed. You should bring a calculator to exams. Make-up exams will only be given in rare instances (medical or family emergencies) with pre-approval by Dr. Pan.

Grading:

Assignments 20%
Midterms 40%
Final Exam 40%

Grading policy: Any re-grade requests must be submitted to Dr. Pan within a week after the grade is returned. Additional curves may be applied, as determined by the overall grade distribution of the class. Grade conversion will be based on the table below.

Percent	Grade	Points
90 - 100	A	4.00
85 - 89	B+	3.33
80 - 84	B	3.00
75 - 79	C+	2.33
70 - 74	C	2.00
65 - 69	D+	1.33
60 - 64	D	1.00
0 - 59	E	0.00

UF policy: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

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.

Honor codes:

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. Any student detected of cheating on homework or examination will receive a failing grade in the course, and documentation will be sent to the Dean of Students Office. 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.

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/>.

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.

ABET Professional Component:

Engineering science: 90%

Engineering design: 5%

Engineering/mathematical analysis: 5%

Relation to Program Outcomes (ABET):

Outcome	Coverage*
a. Apply knowledge of mathematics, science, and engineering	High
b. Design and conduct experiments, as well as analyze and interpret data	
c. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
d. Function on multidisciplinary teams	Low
e. Identify, formulate, and solve engineering problems	High
f. Understand professional and ethical responsibilities	Low
g. Communicate effectively	Medium
h. Understand the impact of engineering solutions in a global, economic, environmental, and societal context	High
i. Recognize the need for and be able to engage in lifelong learning	Medium
j. Understand contemporary issues	Low
k. Use the techniques, skills, and modern engineering tools necessary for engineering practice	High

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

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.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 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>.

EML 4140 Heat Transfer – Spring 2020

Lecture & Assignments Schedule

Week	Date	Lecture Topic	Ch.	Reading	HW Schedule
1	Jan. 7, T	Introduction: what is HT and relevance of HT	1	1.1,1.6	
1	Jan. 9, R	Rate equations, relationship to thermodynamics Introduction to conduction: Fourier's law	1 2	1.2,1.3,1.5 2.1,2.2	HW1 offered
2	Jan. 14, T	Conduction - 1D steady state in plane wall, heat diffusion equation	2 3	2.3, 2.4,3.1	
2	Jan. 16, R	Conduction - 1D steady state in radial system, thermal resistance; 1D steady state with heat generation	3	3.2-3.4 3.5.1,3.5.2,3.5.3	HW2 offered
3	Jan. 21, T	Conduction - Extended surfaces	3	3.6.1, 3.6.2	
3	Jan. 23, R	Conduction - Fin Performance; 2D steady state conduction	3 4	3.6.3-3.6.5 4.1-4.3	HW3 offered
4	Jan. 28, T	Conduction - 2D steady state finite-difference equations	4	4.4-4.5	
4	Jan. 30, R	Conduction - Transient state conduction, lumped capacitance model, analytical and numerical solutions	5	5.1-5.8	HW4 Offered
5	Feb. 4, T	Review for midterm 1	1-5		HW4 Due;
5	Feb. 6, R	Midterm Exam 1	1-5		
6	Feb. 11, T	Introduction to convection	6	6.1- 6.3	
6	Feb. 13, R	Convection - Boundary layers, governing equations, Similarity and dimension analysis	6	6.4- 6.6	HW5 Offered
7	Feb. 18, T	Convection - external flow over flat plate	7	7.1-7.3	
7	Feb. 20, R	Convection - external flow in other geometry, internal flow	7 8	7.3-7.6 8.1 – 8.3	HW6 Offered
8	Feb. 25, T	Convection - internal flow	8	8.4 – 8.7	
8	Feb. 27, R	Convection - Free convection, boiling	9 10	9.1 – 9.6 10.1-10.4	HW7 Offered
9	Mar. 3/5	Spring Break, No Class			
10	Mar. 10, T	Convection - condensation	10	10.6-10.8	
10	Mar. 12, R	Convection - Heat exchanger (LMTD and NTU method)	11	11.1-11.5	HW8 Offered
11	Mar. 17, T	Review for midterm 2	6-11		HW8 Due
11	Mar. 19, R	Midterm Exam 2	6-11		
12	Mar. 24, T	Introduction to Radiation: fundamental concepts, radiation heat fluxes	12	12.1,12.2	
12	Mar. 26, R	Radiation – Radiation Intensity, Blackbody Radiation	12	12.3,12.4	HW9 Offered
13	Mar. 31, T	Radiation – Emission from real surface	12	12.5	
13	Apr. 2, R	Radiation - Absorption, Reflection, transmission, isothermal enclosure, Kirchoff's Law	12	12.6-12.7	HW10 Offered
14	Apr. 7, T	Radiation - Gray surface	12	12.8	
14	Apr. 9, R	Radiation - View factor, blackbody radiation exchange	13	13.1,13.2	HW11 Offered
15	Apr. 14, T	Radiation - Diffuse-gray surface radiation exchange	13	13.3	
15	Apr. 16, R	Radiation - Diffuse-gray surface radiation exchange multimode process	13	13.3 13.4	HW12 Offered
16	Apr. 21, T	Course Review	1-13		
17	Apr. 30. R	Final Exam	1-13		

Work problems on engineering paper, one problem to a sheet

HOME WORK SOLUTION

EXAMPLE PAGE

KNOWN:

State concisely what is known about the problem.

FIND:

State concisely what must be found.

SCHEMATIC:

Draw a schematic of the physical system being considered. Label important variables. If application of the conservation laws is anticipated, represent the appropriate control volume or control surfaces by dashed lines. Be sure to identify processes associated with control volume/surfaces.

PROPERTIES:

List the solid and/or fluid thermophysical properties used in your solution. Identify the table from the Text and especially the temperature at which the property was selected.

ASSUMPTIONS:

It is important that you put all the assumptions in one place so that they can be reviewed. At the outset, some assumptions may be obvious, like “steady-state conditions,” etc. But as you begin to model more complicated systems, the assumptions are extremely important to the logic of your analysis.

ANALYSIS:

Provide in sentence format, comments that make clear the logic and organization of your analysis. Be sure to identify by numbers any figures or equations taken from the Text.