Heat & Mass Transfer in Biological Systems

ABE3612C Section 0129
Class Periods: MWF | Period 5 | 11:45 A.M. – 12:35 P.M. & R | Periods 7-9 | 1:55 P.M.– 4:55 P.M.
Location: Online & ROG 160 (Laboratory)
Academic Term: Fall 2020

IMPORTANT NOTE
This course will be taught using a hybrid model of online synchronous lectures with two (2) face-to-face laboratory sessions. Refer to the ***Online Course Recording***, ***Face-to-Face Course Policy in Response to COVID-19*** *and the* ***COVID-19 Safety Plan*** *sections for additional information.*

Instructor
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Teaching Assistant
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Please contact through the Canvas website

Course Description
Transport phenomena, steady and unsteady-state heat conduction, radiation, free and forced convection, mass transfer, psychometrics and thermodynamics of biological processes. *4 Credits*

Course Co-Requisites
ENV 3040C or CGN 3421 or ESI 4327C or (COP 2271 and COP 2271L)

Course Objectives

1. Provide students with the fundamental knowledge needed to successfully practice the profession of agricultural and biological engineering in the area of heat and mass transfer.
2. Train students to design, test, and analyze systems and processes that involve transport phenomena.
3. Train students to formulate and solve heat and mass transfer problems and to use modern computational and experimental equipment.

Upon successful completion of this course, the student should be capable of analyzing heat and mass transfer processes and making design calculations for many agricultural and biological engineering applications. This course will help students develop their ability to: 1. identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics; 4. to communicate effectively with a range of audience.

The course will consist of three (3) online lectures and one (1) laboratory per week, problem sets, quizzes, projects and examinations. Some of the laboratory sessions will be used to work example problems, for projects, discussions, lectures and exams. Laboratory sessions where students will have to be present on campus will be planned a minimum of two (2) weeks in advance and will be scheduled in collaboration with students to make sure they occur in a safe small-group environment, as per the most current University of Florida safety guidelines.

Materials & Suppy Fees
N/A

Professional Component (ABET)
This course contributes four (4) credit hours toward meeting the minimum 48 credit hours of Engineering Topics in the basic-level curriculum for the Bachelor of Science Degree in Biological Engineering.

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	
3.	An ability to communicate effectively with a range of audiences	Low
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	

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

Required Textbook
Heat and Mass Transfer: Fundamentals & Applications
Yunus A. Çengel & Afshin J. Ghajar
2020 6th Edition (eBook with Connect is required)

All required online assignments and the interactive eBook for this course are available in Connect. To get started, click the first Connect assignment in your Canvas course. You'll be prompted to either login with an existing Connect account username and password, or to create a new account. Then enter your access code, purchase access online or begin your 14-day Courtesy Access period. Once you've completed your selection, you'll arrive at the start of your first Connect assignment. In Connect, every question links directly to the eBook. This means that when you are struggling with a question you can go directly to the explanation in the eBook for help without carrying around a heavy textbook. You can access the eBook from any computer, any time. If you also want to purchase a print text, you can buy a discounted loose-leaf version of your book within Connect with the click of a button.

`https://connect.mheducation.com/paamweb/index.html#/registration/signup/w-pelletier-abe3612c---fall-2020`

Course Schedule (subject to change)

Week 1	31-Aug	4-Sep	M	Syllabus	Week 9	26-Oct	30-Oct	M	Numerical Methods
			W	Introduction and Basic Concepts				W	Numerical Methods
			R	Heat Conduction Equation				R	**Laboratory 3 - Numerical Methods**
			F	Heat Conduction Equation				F	Numerical Methods
Week 2	7-Sep	11-Sep	M	**Labor Day**	Week 10	2-Nov	6-Nov	M	External Forced Convection
			W	Introduction and Basic Concepts				W	External Forced Convection
			R	Heat Conduction Equation				R	External Forced Convection
			F	Heat Conduction Equation				F	Internal Forced Convection
Week 3	14-Sep	18-Sep	M	Heat Conduction Equation	Week 11	9-Nov	13-Nov	M	Internal Forced Convection
			W	Heat Conduction Equation				W	**Veterans Day**
			R	Heat Conduction Equation				R	**Supervised Exercises**
			F	Steady Heat Conduction				F	Internal Forced Convection
Week 4	21-Sep	25-Sep	M	Steady Heat Conduction	Week 12	16-Nov	20-Nov	M	Internal Forced Convection
			W	Steady Heat Conduction				W	Internal Forced Convection
			R	**Laboratory 1**				R	**EXAM 2**
			F	Steady Heat Conduction				F	Internal Forced Convection
Week 5	28-Sep	2-Oct	M	Steady Heat Conduction	Week 13	23-Nov	27-Nov	M	Internal Forced Convection
			W	Steady Heat Conduction				W	**Thanksgiving**
			R	**Supervised Exercises**				R	**Thanksgiving**
			F	Transient Heat Conduction				F	**Thanksgiving**
Week 6	5-Oct	9-Oct	M	Transient Heat Conduction	Week 14	30-Nov	4-Dec	M	Natural Convection
			W	Transient Heat Conduction				W	Heat Exchangers
			R	**EXAM 1**				R	Heat Exchangers
			F	Transient Heat Conduction				F	Heat Exchangers
Week 7	12-Oct	16-Oct	M	Transient Heat Conduction	Week 15	7-Dec	11-Dec	M	Radiation Heat Transfer
			W	Transient Heat Conduction				W	Radiation Heat Transfer
			R	**Laboratory 2 - Transient**				R	**No Class**
			F	Transient Heat Conduction				F	**No Class**
Week 8	19-Oct	23-Oct	M	Transient Heat Conduction	Week 16	14-Dec	18-Dec	M	**No Class**
			W	Transient Heat Conduction				W	**No Class**
			R	**Laboratory 2 - Transient**				R	**No Class**
			F	Numerical Methods				F	**No Class**

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.

Face-to-Face Course Policy in Response to COVID-19
We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom (for laboratory sessions) with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms (Click here for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

Attendance Policy, Class Expectations, and Make-Up Policy

- Attendance (on time) at lectures and laboratory sessions is expected from all students at all times. Attendance accounts for 10% of your final grade. It is planned that attendance will be monitored through Zoom's attendance records, this may be subject to change depending on the availability of other technologies or if technical problems were to arise. Students will be warned if they are late at several occasions. Following a second warning, late attendances will be counted as missed lectures.
- Assignments must will have to be submitted online in pdf format. Scanned versions of handwritten problems are expected; calculations do not have to be typed for homework assignments. Assignments will be marked down for a sloppy presentation and, if excessive, they may be returned un-graded. Laboratory and project reports, including all calculations, must be typed. Homework assignments as well as laboratory and project reports must be turned in before class begins. Assignments returned late, before 4:00 P.M. on the day they were due, will be marked down by 10% of their total. Assignments returned late, before 4:00 P.M. on the day following the due date will be marked down by 50% of their total (assignment must be emailed if submitted on a Saturday). No assignments will be accepted after 4:00 P.M. on the following day. For all online submissions, it is the student's responsibility to ensure that the correct file is uploaded on Canvas. If technical difficulties with Canvas were to occur, students can email the file to wpelletier@ufl.edu to avoid a late submission (if you email a copy , also upload a "late" copy in Canvas).
- No make-up exams or quizzes will be given except for valid medical reasons or unless prior arrangements have been made.
- Exams will be taken online and will require students to upload a scanned handwritten calculations in a pdf version. More details will be provided during virtual lecture meetings.
- Excused absences must be consistent with university policies in the undergraduate catalog (`https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx`) and require appropriate documentation.

Evaluation of Grades

Assignment	Percentage of Final Grade
Final Exam [1](12/18 12:30 P.M.–2:30 P.M.)	20%
Midterm Exams (expected dates: 10/8 & 11/19 at 1:55 P.M.)	40% (20% each)
Homework & Reading Assignments	20%
Attendance	10%
Laboratories, Quizzes and Final Project [2]	10%
TOTAL	100%

[1] Students that have cumulated an average of A for the first two examinations, submitted all homework assignments (high quality), the final project (high quality), and show excellent attendance (A) to class (including the period after the second examination) will be exempt from writing the final examination and will receive an A for the class.
[2] Grades will be distributed between laboratory attendance, quizzes, reports, and the final project.

Grading Policy

Percent	Grade	Grade Points
[90 – 100%]	A	4.00
[87 – 90%[	A-	3.67
[84 – 87%[	B+	3.33
[80 – 84%[	B	3.00
[77 – 80%[	B-	2.67
[74 – 77%[	C+	2.33
[70 – 74%[	C	2.00
[67 – 70%[	C-	1.67
[64 – 67%[	D+	1.33
[60 – 64%[	D	1.00
[57 – 60%[	D-	0.67
[0 – 57%[	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.

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@eng.ufl.edu

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: `https://registrar.ufl.edu/ferpa.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 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

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.

COVID-19 Safety Plan

Student Requirements

- **Face Coverings** Face coverings are to be supplied by students and worn throughout the duration of the face-to-face synchronous laboratory session on UF property. If the student forgets their face covering, then one may be provided by the instructor if available. If one is not available, then the student will be asked to leave and reschedule his/her laboratory session.
- **Social Distancing** Social distancing must be observed throughout the duration of the face-to-face synchronous laboratory session – this is defined as maintaining a minimum physical distance of six (6) feet between the student, their peers, instructors, and technicians.
- **Hand Washing/Sanitizing** Upon entering the laboratory, students will be required to wash their hands for a minimum of twenty (20) seconds and put on a pair of provided laboratory gloves. Hand washing will also be required after gloves are removed.
- **Student Illness** If a student does not feel well and/or is running a fever or displaying any other symptoms of illness, they are NOT to attend the face-to-face synchronous session. Please see contingency plans for student illness for more information.

Instructor Requirements

- **Face Coverings** Instructors and technicians will supply their own face coverings and wear them throughout the duration of the face-to-face synchronous laboratory session while on UF property.
- **Social Distancing** Social distancing must be observed throughout the duration of the face-to-face synchronous laboratory session. A minimum physical distance of six (6) feet will be maintained between all participants to the laboratory session. In instances where an instructor or laboratory technician must breach the social distancing barrier to assist with hands-on instruction, the student and instructor/technician should not pose a public health safety risk due to other public health requirements being employed (mandatory face coverings, hand washing/sanitizing, etc.). Breaching the social distance barrier will only be done when absolutely necessary and for the minimum period of time required to accomplish the learning objective.
- **Hand Washing/Sanitizing** Upon entering the laboratory, instructor and technician will be required to wash their hands for a minimum of twenty (20) seconds and put on a pair of provided laboratory gloves. Hand washing will also be required after gloves are removed.
- **Instructor or Technician Illness** If an instructor or technician does not feel well and/or is running a fever or displaying other symptoms of illness, they will not attend the face-to-face synchronous laboratory session. For more information, please see the instructor illness contingency plans.

Ingress/Egress Process

Students will be asked to follow the ABE safety protocol for safe traffic inside Frazier Rogers Hall. As mentioned in the Student Requirements section, students will have to wash their hands upon entering the laboratory and also upon leaving the laboratory. Hand washing is mandatory for any ingress/egress to/from the laboratory.

Cleaning Procedures

Classrooms will be cleaned by university custodial staff in between uses. The instructor and technician will examine the classroom and equipment prior to each face-to-face synchronous laboratory session to ensure cleaning has occurred. Instructors and technician will clean and sanitize the classroom and equipment as needed prior to students arriving for a laboratory session. When available, different keyboards and pointing devices will be used for each laboratory session to allow thorough cleaning between sessions. To help minimize risks of contamination, students will also be asked to wear gloves throughout the laboratory sessions.

Laboratory Sessions

- Small-group laboratory sessions will be planned and scheduled with the students a minimum of two (2) weeks in advanced to keep the number of participants in the laboratory to a maximum of five (5). Laboratory sessions may have to be scheduled, according to students availability, outside regular laboratory time, but will not lead to additional time commitment for the students.
- Each student will have its own station and equipment for all laboratory work. Stations will be spaced by a minimum distance of six (6) feet from one another.
- A total of two (2) face-to-face synchronous laboratory sessions will take place (laboratory 1 and 2, refer to syllabus for more details).

Contingency Plans

- **Students Illness** If a student does not feel well and/or is running a fever or displaying any other symptoms of illness, they are NOT to attend the face-to-face synchronous laboratory session. In that case, they will be required to notify the instructors for alternative online instructional options that will include recorded laboratory demonstrations, instructor-provided data set, and alternative assignments to meet educational objectives.
- **Instructor Illness** If an instructor does not feel well and/or is running a fever or displaying other symptoms of illness, they will not attend the face-to-face synchronous laboratory session. In that case, alternative online instructional activities that will include recorded laboratory demonstrations, instructor-provided data set and alternative assignments to meet educational objectives will be used and administered by the teaching assistant. Note that the teaching assistant will not attend or participate to any of the preparation or delivery of the face-to-face laboratory sessions.
- **Cancellation of Face-to-Face Laboratory Sessions** In the event face-to-face instruction is canceled by the University of Florida at any time during the semester, the use of contingency material developed prior to the start the semester will be used to accomplish learning objectives through an online teaching environment.