FLORIDA POLYTECHNIC UNIVERSITY

EML 4140-01 Heat Transfer

Syllabus

Course Information

- **Course Number and Title**: EML4140ENGR.01 Heat Transfer
- **Credit Hours:** 3 lecture/0 lab
- **Academic Term:** Spring 2026

Instructor Information

- **Instructor:** Gerardo Carbajal, PhD.
- **Office Location:** BARC-1177
- **Office Hours**: TU-TR 4:00-5:00 PM, Wednesday 11:00 AM-12:00 PM or by appointment.
- **Email address**: gcarbajal@floridapoly.edu

Course Delivery and Course Description

- **Delivery Mode**: In-person attendance
- **Class Meeting Day, Time & Location:** TU-TR 2:30 PM – 3:45 PM, IST-1064
- **Course Website**: N/A
- **Official Catalog Course Description**: The course presents the three modes of heat transfer: conduction, convection, and radiation. One-dimensional steady conduction and extended surfaces are covered in detail. Simple transient heat transfer problems are modeled with the lumped capacitance analysis method. Convection heat transfer is studied for various internal and external geometries and under laminar and turbulent flow regimes. Selected topics in heat exchangers and radiation heat transfer are studied for practical applications
    - **Course Pre and/or Co-Requisites**:
      EGN 3343 Engineering Thermodynamics, EML 3015 Fluid Mechanics, MAC 2313 - Analytic Geometry and Calculus 3, MAP 2302 – Differential Equations.
    - **Communication/Computation Skills Requirement (6A-10.030)**: No.
- **Required Texts:**
    - Fundamentals of Heat and Mass Transfer, 8th Edition, Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt. ISBN: 978-1-119-35388-1.
- **Equipment and Materials:** Only the following calculator models used on the Fundamentals of Engineering (FE) Exam will be allowed for the exams**:**
    - Casio: All fx-115 and fx-991 models (Any Casio calculator must have “fx-115” or “fx-991” in its model name.)
    - Hewlett Packard: The HP 33s and HP 35s models, but no others
    - Texas Instruments: All TI-30X and TI-36X models (Any Texas Instruments calculator must have “TI-30X” or “TI-36X” in its model name

Course Objectives and Outcomes

- **Course Objectives**:
  This course aims to provide the students with the fundamental knowledge for solving problems and analyzing the heat transfer process. To achieve this objective, the study will include a detailed analysis of the conduction, convection, and radiation heat transfer.
- **Course Learning Outcomes**:
    - Identify the three modes of heat transfer and give examples of engineering applications.

- Analyze the performance of devices that involve conduction heat transfer, such as fins.
- Compute heat transfer coefficients for heat convection situations from theory and empirical relations for a variety of engineering geometries, including pipe flow, external flow, and buoyancy-driven flow.
- Analyze heat exchanger performance for gas-gas, gas-liquid, and liquid-liquid applications.
- Apply the methods of black and non-black analysis to radiation heat transfer devices.
- Effectively communicate the knowledge of heat transfer.

- **Alignment with Program Outcomes**:

Course Learning Outcome	Learning Level (Bloom's ABET Assessment)	Program Learning Outcome (ABET)
The students will identify the three modes of heat transfer and give examples of engineering applications	**Knowledge**- Ability to recall previously learned material. **ABET Assessment** – homework, Quiz	ABET 1- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
The students will analyze the performance of devices that involve conduction heat transfer such as fins	**Analysis**- Ability to distinguish, classify, and relate the assumptions, evidence, or structure of a question. **ABET Assessment** – homework, exam questions	ABET 1- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
The students will compute heat transfer coefficients for heat convection situations from theory and from empirical relations for a variety of engineering geometries including pipe flow, external flow, and buoyancy-driven flow	**Application**- Ability to select, transfer, and use data and principles to complete a problem or a task. **ABET Assessment** – homework, exam questions	ABET 1- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Analyze heat exchanger performance for gas-gas, gas-liquid, and liquid-liquid applications	**Analysis**- Ability to distinguish, classify, and relate the assumptions, evidence, or structure of a question. **ABET Assessment** – homework, exam questions	ABET 1- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Apply the methods of black and non-black analysis to radiation heat transfer devices	**Application**- Ability to select, transfer, and use data and principles to complete a problem or a task. **ABET Assessment** – homework, exam questions	ABET 1- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
Effectively communicate the knowledge of heat transfer	**Application** – Ability to use learned material in new situations. **ABET Assessment** – design project	ABET 3- an ability to communicate effectively with a range of audiences

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations. If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal, and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive. If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible: DisabilityServices@floridapoly.edu; (863) 874-8770; www.floridapoly.edy/disability.

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence, and stalking. Resources are available if you or someone you know needs assistance. Any faculty or staff member you speak to is required to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discuss resources and options available.

Academic Integrity

Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in sanctions up to and including expulsion from the university.

Recording Lectures

- Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action). Recording class activities, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers, is ***prohibited***.

Course Policies

Attendance

- Students in **face-to-face (this includes labs and C-courses)** courses are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP).
- Absence does not excuse a student from material covered or any activity done on that day, nor does it extend a deadline.
- Students should inform the instructor as soon as possible if an absence is expected.
- The instructor should be contacted as soon as possible if an absence is due to an unforeseen emergency. Documentation may be required in either case.

Participation

Students are expected to participate in the classroom experience. The use of earbuds/headphones during class is specifically not allowed and students who engage in this behavior may be asked to leave the class for the day (noting exceptions for authorized accommodations). In addition, students who routinely do not bring materials to class that are required for participation, will not be given credit for class attendance, and if this becomes a pattern of behavior, may be asked to leave the class for the day. Persistent problems with participation may result in a code of conduct referral.

Late Work/Make-up work

Makeup is never given for in-class activities/quizzes. Makeup is provided for exams only in exceptional cases, upon valid documentation.

No late assignments/projects will be accepted.

Grading Scale

This class will apply the following grading scale. *(See also University Grading Policy).*

Grade	Percentage
A	93 - 100
A-	90 - 92
B+	86 - 89
B	83 - 85
B-	80 - 82
C+	76 - 79
C	70 - 75
D	60 - 69
F	0 - 59

Assignment/Evaluation Methods

- **Quiz/In-class activity (8% of the total grade)**
  - Quizzes or in-class activities will occur either in class or through Canvas. A missed in-class quiz cannot be made up.
- **Homework (15% of the total grade)**
  - Homework assignments are intended to enhance learning, promote 'habits of mind,' and give students the opportunity to demonstrate what they have learned after the material is covered in class.
  - Homework must be submitted via Canvas as a PDF file by the due date. It is acceptable (and perhaps preferable) that you work on the problems on paper and then use a mobile phone scanner app to convert them into a high-quality PDF.
  - Homework should be done independently.
- **Project (12% of the total grade)**
  - A course project report must be submitted. The project report must be a complete electronic document (Word or PDF) with paragraphs that explain the problem statement, methodology, results, and discussion, and include relevant figures, tables, and equations.
- **Exams (2 @ 20% each and Final @20%)**
  - Exams will cover all material covered prior to the class session before the exam. Students are responsible for reviewing all the material and discussing any topics they are concerned about with the instructor during office hours prior to the exam.
  - The two exams during the semester will be scheduled during class hours. The dates and times of exams will be provided as soon as they are known. The final exam will be held during the scheduled final exam period.
- **Attendance (5% of the total grade)**

Exam Policy: A student missing an exam can only make up for the exam if he/she presents satisfactory evidence that his/her absence was unavoidable. It is the duty of the student to notify the instructor before the exam or within twenty-four hours of the time of absence, at which time arrangements will be made for a make-up exam.

An exact percentage of the evaluation method is shown as follows:

Activity	Percentage
Homework	15
Quizzes/In-class activities	8
Project	12
Attendance	5
Exam-1	20
Exam-2	20
Final Exam	20

Grades will be posted to Canvas for reference only; students should ensure they are recorded correctly. However, there is no guarantee that the percentages or projected grades provided are correct.

The instructor will calculate final percentages and determine final grades regardless of Canvas calculations.

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Tutoring and Learning Center**: The Tutoring and Learning Center (The TLC) provides tutoring to all Florida Poly students who may need additional academic support. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion, and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses, upper-level courses are also tutored at the Center. The TLC is located in the IST Commons (second floor).
    - **Knack Tutoring**: Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.
- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.

Writing Center: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more details, visit floridapoly.edu/writing center.

Course Schedule (Tentative)

- Changes in syllabus and assignment sheets may be made as deemed appropriate. All changes will be announced in class and Canvas Announcements.
- Important Dates: https://floridapoly.edu/academics/academic-calendar/index.php

Week	Date	Day	Topic	Reading
1	2026.01.13	1	Introduction: Modes of Heat Transfer	Ch 1
	2026.01.15	2	Conservation of Energy	Ch 1
2	2026.01.20	3	Heat Diffusion Equation	Ch 2
	2026.01.22	4	Boundary conditions	Ch 2/HW1
3	2026.01.27	5	1D Steady Conduction – plane wall	Ch 3
	2026.01.29	6	1D Steady Conduction – radial, spherical walls	Ch 3
4	2026.02.03	7	Thermal Resistances	Ch 3/HW2
	2026.02.05	8	Thermal Resistances	Ch 3
5	2026.02.12	9	Extended Surfaces	Ch 3
6	2026.02.17	10	Extended Surfaces	Ch 3/HW3
	2026.02.19	11	**Exam 1**	
7	2026.02.24	12	Transient Conduction	Ch 5
	2026.02.26	13	Transient Conduction	Ch 5
8	2026.03.03	14	Transient Conduction	Ch 5
	2026.03.05	15	Introduction to Convection. Boundary Layer Equations, Reynolds Analogy	Ch 6
9	2026.03.10	16	Convection - examples	Ch 6/HW4
	2026.03.12	17	External Flow – flat plate, laminar	Ch 7
10	2026.03.24	18	External Flow – flat plate, turbulent	Ch 7/HW5
	2026.03.26	19	External Flow – cylinder, sphere, tube banks	Ch 7
11	2026.03.31	20	External Flow – examples	Ch 7/HW6
	2026.04.02	21	**Exam 2**	
12	2026.04.07	22	Internal Flow – hydrodynamic, thermal	Ch 8
	2026.04.09	23	Internal Flow – entrance region fully developed, laminar	Ch 8
13	2026.04.14	24	Internal Flow – turbulent	Ch 8/HW7
	2026.04.16	25	Heat exchangers	Ch 11
14	2026.04.21	26	Heat Exchangers	Ch 11
	2026.04.23	27	Introduction to radiation heat transfer	Ch 12

15	2026.04.28	28	Introduction to radiation heat transfer	Ch 12/HW8
	TBA		**Final Exam**	