



Philadelphia University

Faculty of Engineering and Technology
- Department of Mechanical Engineering
Second Semester 2020/2021

Course Information

Title: Heat Transfer-1 (620420)

Prerequisite: Thermodynamics-1 (620323)

Credit Hours: 3 Credit hours (16 weeks per semester, approximately 44 contact hours)

Textbook: Fundamentals of Mass and Heat Transfer, 8th. Edition or latest by Incropera, DeWitt, Bergman and Lavine, Wiley

References: Heat Transfer, By J. P. Holman, 6th. Edition, McGraw-Hill

Catalog Description: Introduction to modes of heat transfer; One-dimensional steady-state conduction; Un-steady state conduction, Lumped heat capacity systems; Introduction to convection; Hydro-dynamic and thermal boundary layers; Laminar and turbulent boundary layers, Convection in external and internal flows; Empirical relations for forced convection heat transfer; Heat exchangers.

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Engineering building, room E724, Ext. 2338
Office hours: Sun, Tue, Thurs.. 10:00- 11:00

Course Topics Week No.	Description	Chapter
1, 2	Introduction to heat transfer in various modes: conduction, convection and radiation.	1 , 2
3, 4	Introduction to conduction, conduction rate equation, thermal conductivity, Heat diffusion equation, Boundary and initial conditions.	3
5	1-D Un-steady state conduction, Lumped capacity systems	5
6	Introduction to convection. Convection boundary layer, Laminar and turbulent flow, Convection transfer equation Velocity and thermal boundary conditions, Boundary layer similarity.	6
7, 8	External flow; Flat-plate, unheated starting length, Cylinder in cross flow; Banks of tubes.	7
9, 10	Internal flow; Fully developed region, Energy balance equation, Heat transfer coefficient in laminar and turbulent flow, Non-circular tubes, Heat transfer enhancement.	8
11, 12	Heat exchangers; Heat exchanger types, Overall H.T.coefficient, Logarithmic Mean Temperature Difference (LMTD) Method, NTU Method	11
13-16	Review and final exam	

Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should:

1.	Be able to identify various modes of heat transfer in solids and fluids.	[1]
2.	Be able to identify various thermal and physical properties of material in relation to heat transfer and to understand the effect of temperature on those properties.	[1]
3.	Have the ability to calculate thermal resistances and heat losses of various engineering elements, such as plane and composite walls, cylinders and spheres.	[1]
4.	Understand the basics of thermal performance of heat transfer in extended surfaces.	[1]
5.	Analyze heat transfer in simple transient situations, such as lumped capacitance systems.	[1]
6.	Estimate heat transfer by forced convection in various engineering situations, Such as vertical and horizontal plane walls and cylinders.	[1]
7.	Size a heat exchanger.	[1]

Assessment tools:

Evaluation of students' performance (final grade) will be based on the following categories:

Exams: One Midterm exam will be given. It will cover about 8-weeks of lectures

Quizzes and participation: 15-minute quizzes will be given to the students during the semester. These quizzes will cover material based on homework problems given to students earlier. Class participation will be based on taking those quizzes.

Homework: Problem sets will be given to students. Homework should be solved individually but they do not have to be turned-in. Instead, students should be able to sit for a quiz in one of the homework problems given earlier, or a problem similar to it..

Final Exam: The final exam will cover all the class material.

Grading policy:

15 minute quizzes	20%
Midterm exam	30%
Final Exam	50%

Total: 100%

Attention to basic attendance policy:

Absence from classes and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse, acceptable to and approved by the Dean of the relevant college/faculty, shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.