

ME 144 A Heat Transfer

Semester	Spring 2022	
Classroom	TBD	
Meeting time	1:15--2:30	
Instruction	Yves Dubief, ydubief@uvm.edu	Office hours: TBD
TA(s)	TBD	Office hours: TBD
Prerequisites	ME 143	
Credit hours	3	
Textbook	Fundamentals of Heat and Mass Transfer, 8th Edition, ISBN-13: 978-1119582786 Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt	
Software	Python 3 (Anaconda distribution) https://github.com/yvesdubief/UVM-ME144-Heat-Transfer	

Course description

One{-} and two{-}dimensional steady and unsteady thermal conduction; natural and forced internal and external convection; thermal radiation; heat exchangers; boiling and condensation heat transfer

Course objectives

- To demonstrate the ability to understand and identify relevant modes of heat transfer in physical problems.
- To demonstrate the ability to analyze 1{-}D and multi{-}dimensional steady{-}state heat conduction in bodies with various thermal boundary conditions and with possibly multiple component materials.
- To demonstrate the ability to model and solve unsteady 0{-}D (lumped capacitance method) and 1{-}D heat transfer problems; effects of thermal boundary conditions.
- To demonstrate the ability to model and solve 1D unsteady heat transfer involving phase change (melting, solidification)
- To demonstrate the ability to understand the mechanisms of convective heat transfer and to demonstrate the ability to utilize analytical and empirical relations for the solution of engineering heat transfer problems.
- To demonstrate the ability to understand and apply basic numerical methods (finite difference, finite volume) to solve steady and unsteady heat transfer problems.
- To demonstrate the ability to design algorithms based on imposed constraints and/or equations.

Grade distribution and assessment

Weekly assignments	40 %
In-class exams	30 %
Project	30 %

Letter grade distribution

100.0--93.00	A	73.00--76.99	C
90.00--92.99	A-	70.00--72.99	C-
87.00--89.99	B+	67.00--69.99	D+
83.00--86.99	B	63.00--66.99	D
80.00--82.99	B-	60.00--62.99	D-
77.00--79.99	C+	59.99--00.00	F

Policies

Classroom Environment Expectations

Working in groups is encouraged at the beginning of the semester. If so, please enter the names of students in your study group at the beginning of the notebook. You are expected to follow the Code of Academic Integrity of the University of Vermont and expectations written in Our Common Ground. Any act of plagiarism will result in no more than one warning. Further violation of the academic integrity contract will result in a report to the Center for Student Conduct and a grade of zero for the assignment. Due to the online nature of the course, office hours will be conducted via forums. Be courteous and productive. Instructors and TAs will answer your question within 24 hours. Students are expected to use blackboard for forums and download and upload of course documents, and read emails sent by instructors.

Late assignment

Assignments are expected to be uploaded on blackboard in the requested format by the deadline set by the instructor. Late assignment will result in a loss of 10/100 points. With sufficient justification, you may ask for an extension no later than 48 hours before the deadline. Please contact the instructor as soon as you can in case of an emergency.

Tentative schedule

Week	Content
1	Thermodynamics, Modes of heat transfer, heat transfer coefficients
2	Conduction, Fourier's law, thermal properties of matter, heat equation, boundary conditions, temperature distribution
3	1D Conduction, Planar system thermal resistance, composite wall, contact resistance, thermal energy generation
4	1D conduction, Radial systems, extended surfaces
5	Exam, 2D conduction, Finite volume
6	2D conduction + Transient conduction, Linear Algebra and time-stepping methods, Analytical solutions
7	Conduction wrap up
8	Convection, Review of fluid mechanics, intro to convection, External flows
9	Convection, External flows (cont'd)
10	Exam (in class), Convection, Internal flows
11	Convection, Internal flows, Free and forced convection
12	Free convection, Boiling and Condensation
13	Boiling and condensation, Radiation
14	Radiation