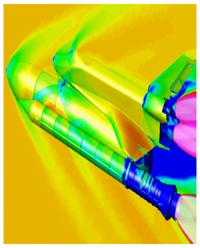
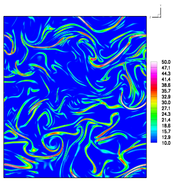


ME 144

Heat Transfer

T–Th, 8:30–9:45, Lafayette 207



Yves Dubief, Associate Professor of Mechanical Engineering
TA: TBA

Email:ydubief@uvm.edu
Web: BlackBoard and
https://github.com/yvesdubief/UVM-ME144-Heat-Transfer
Office Location: Votey Hall, 201C
Office Hours: W TBA (Instructor), TBA (TA)
(802) 656-1930

The content of this syllabus may change with appropriate notification to the students.

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
Prerequisite(s): ME143
Note(s): You are expected to:

- Use your own laptop,
- Install python 3 using `http://continuum.io/downloads`,
- Install the python library schemdraw
`http://www.collindelker.com/wp/2014/08/electrical-schematic-drawing-python/`
- Understand how to start the Jupyter-notebook application for python notebook
`http://jupyter-notebook-beginner-guide.readthedocs.org/en/latest/execute.html`
- Upload your assignments on blackboard

For python, use your uvm.edu address, which will give you access to academic freebies. Other tutorials worth checking are: `https://www.codecademy.com/learn`, and MIT opencourseware.
Credit Hours: 3

Text(s): *Fundamentals of Heat and Mass Transfer 8th Edition*,
Author(s): Bergman et al., Wiley;

Course Objectives:

At the completion of this course, students will be able to:

1. Understanding of, and ability to identify, relevant modes of heat transfer in physical problems.

2. Analysis of 1-D and multi-dimensional steady-state heat conduction in bodies with various thermal boundary conditions and with possibly multiple component materials. Analysis of thin fins for heat transfer efficiency.
3. Modeling and solution of unsteady 0-D (lumped capacitance method) and 1-D heat transfer problems; effects of thermal boundary conditions.
4. Modeling and solution of 1D unsteady heat transfer involving phase change (melting, solidification)
5. Understanding mechanisms of convective heat transfer; ability to utilize analytical and empirical relations for the solution of engineering heat transfer problems.
6. Obtain basic knowledge of numerical methods (finite difference, finite volume) used in solving steady and unsteady heat transfer problems.

Grade Distribution and Assessment:

This course combines traditional exams and projects. The instructor may assign quizzes with minimal warning (e.g. announcing that a quizz is coming up but not the specific date).

Homew
Midter
Project
Final E

Midterm Grade=0.15[Lowest Midterm]+0.85[Highest Midterm]

Letter Grade Distribution:

>= 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	F

Grading Scheme (over 10 points):

10	Correct answer
8	Answer uses the correct physics and/or mathematics but has one small error (e.g. typo)
6	One significant error violating the physics and/or mathematics of the problem.
4	Two significant errors violating the physics and/or mathematics of the problem.
2	An attempt to answer
0	Self-explanatory

Course Policies:

- **General**
  - Asking the instructor for help is encouraged during office hours or by appointment outside of office hours.
  - Follow the tutorials from enthought for python
  - **If you cannot make a deadline, please warn the instructor 24 hours before the deadline.**
- **Grades**
  - Grades in the **C** range represent performance that **meets expectations**; Grades in the **B** range represent performance that is **substantially better** than the expectations; Grades in the **A** range represent work that is **excellent**.

- Grades will be maintained in the Blackboad Grade Center. Students are responsible for tracking their progress.

- **Assignments**
  - Students are expected to work independently. **Offering** and **accepting** solutions from others is an act of **plagiarism**, which is a serious offense and **all involved parties will be penalized according to the Academic Honesty Policy**. Discussion amongst students is encouraged, but when in doubt, direct your questions to the professor.
  - **Late assignments will be accepted under reasonable circumstances**.

- **Attendance and Absences**
  - Attendance is expected, and will be taken randomly.
  - With the exception of exceptional circumstances, the instructor must be notified of your absence and its justification 24 hours before the lecture.
  - It is the absentee's responsibility to get all missing notes or materials.

Tentative Course Outline:
The weekly coverage might change as it depends on the progress of the class. However, you must keep up with the reading assignments.

Week	Content
Week 1	• Thermodynamics • Modes of heat transfer, heat transfer coefficients
Week 2	• Conduction • Fourier's law, thermal properties of matter, heat equation, boundary conditions, temperature distribution
Week 3	• 1D Conduction • Planar system thermal resistance, composite wall, contact resistance, thermal energy generation
Week 4	• 1D conduction • Radial systems, extended surfaces
Week 5	• Exam (take home) • 2D conduction • Finite volume
Week 6	• 2D conduction + Transient conduction • Linear Algebra and time-stepping methods • Analytical solutions
Week 7	• Conduction • Wrap up
Week 8	• Convection • Review of fluid mechanics, intro to convection • External flows
Week 9	• Convection • External flows (cont'ed) • Internal flows
Week 10	• Exam (in class) • Convection • Internal flows
Week 11	• Convection • Internal flows • Free and forced convection
Week 12	• Free convection • Boiling and Condensation
Week 13	• Boiling and condensation • Radiation
Week 14	• Radiation
Week 15	• Review