

ME EN 340 HEAT TRANSFER
Fall 2025, Section 3: MWF 3:00 – 3:50 pm, 321 EB

Class Date	Topic	Reading*	Homework**	Due
1 W Sep 3	Course introduction	Syllabus	HW1: 1.7(P), 1.12(P)	Tu Sep 9
2 F Sep 5	Modes of heat transfer, Conservation of energy	1.1 – 1.7	HW2: 1.17, 1.27(P), 1.43	Tu Sep 9
3 M Sep 8	Conduction and properties	2.1 – 2.2	HW3: 2.6, 2.15	Tu Sep 16
4 W Sep 10	Heat diffusion eqn, boundary conditions	2.3 – 2.5	HW4: 2.23a-e, 2.43(P)	Tu Sep 16
5 F Sep 12	1D steady state conduction, thermal resistance	3.1	HW5: 3.5ab(P), 3.26a	Tu Sep 16
6 M Sep 15	Thermal resistance- radial systems	3.3	HW6: 3.45, 3.55(P)	Tu Sep 23
7 W Sep 17	Conduction with thermal energy generation	3.5	HW7: 3.64(P), 3.74	Tu Sep 23
8 F Sep 19	Extended surfaces	3.6.1 – 3.6.2	HW8: 3.99(P), 3.115	Tu Sep 23
9 M Sep 22	Extended surfaces- effectiveness and efficiency	3.6.3 – 3.6.5, 3.8	HW9: 3.106, 3.107(P)	Tu Sep 30
10 W Sep 24	2D steady state conduction- numerical	4.1, 4.4, 4.5	HW10: 4.50(P), BHTE	Tu Sep 30
11 F Sep 26	Transient conduction- lumped capacitance	5.1 – 5.3	HW11: 5.7, 5.13(P)	Tu Sep 30
12 M Sep 29	Transient conduction- spatial effects	5.4 – 5.7	HW12: 5.61, 5.67(P)	Fri Oct 3
13 W Oct 1	Transient conduction- numerical	5.10	HW13: 5.88, 5.98(P)	Fri Oct 3
14 F Oct 3	Conduction review			
15 M Oct 6	Exam 1			
16 W Oct 8	Introduction to convection	6.1 – 6.3	HW14: 6.1(P), 6.11	Tu Oct 14
17 F Oct 10	Boundary layer equations, similarity	6.4 – 6.6	HW15: 6.10(P), 6.30	Tu Oct 14
18 M Oct 13	External flow- flat plate	7.1 – 7.3	HW16: 7.16, 7.33(P)	Tu Oct 21
19 W Oct 15	External flow- spheres and cylinders	7.4, 7.5	HW17: 7.41(P), 7.65ab	Tu Oct 21
20 F Oct 17	Internal flow- boundary layers	8.1	HW18: 8.7, 8.9	Tu Oct 21
21 M Oct 20	Internal flow- energy balance	8.2, 8.3	HW19: 8.12(P), 8.14	Tu Oct 28
22 W Oct 22	Convection correlations- laminar and turbulent circular	8.4, 8.5	HW20: 8.27, 8.29(P)	Tu Oct 28
23 F Oct 24	Convection correlations- non-circular	8.6, 8.10	HW21: 8.64, 8.66(P)	Tu Oct 28
24 M Oct 27	Convection practice		HW22: 8.37	Tu Nov 4
25 W Oct 29	Laminar free convection	9.1 – 9.3	HW23: 9.10(P), 9.15	Tu Nov 4
26 F Oct 31	Free convection correlations	9.4 – 9.6	HW24: 9.31(P), 9.45a	Tu Nov 4
27 M Nov 3	Heat exchangers	11.1 – 11.3	HW25: 11.2(P), 11.9	Th Nov 6
28 W Nov 5	Convection review			
29 F Nov 7	Exam 2			
30 M Nov 10	Radiation concepts, intensity	12.1 – 12.3	HW26: 12.9(P), 12.12	Tu Nov 18
31 W Nov 12	Blackbody radiation	12.4	HW27: 12.14(P), 12.16	Tu Nov 18
32 F Nov 14	Real surfaces- absorption, reflection, transmission	12.5 – 12.6	HW28: 12.27	Tu Nov 18
33 M Nov 17	Kirchoff's Law, gray surfaces	12.7 – 12.8	HW29: 12.33, 12.76a-d(P)	Tu Nov 25
34 W Nov 19	Environmental radiation	12.9 – 12.10	HW30: 12.87(P), 12.101(P)	Tu Nov 25
35 F Nov 21	View factors	13.1	HW31: 13.1, 13.9(P)	Tu Nov 25
36 M Nov 24	Blackbody radiation exchange	13.2	HW32: 13.18(P), 13.23	Tu Dec 9
-- W Nov 26	Thanksgiving: No class			
-- F Nov 28	Thanksgiving: No class			
37 M Dec 1	Radiation exchange- diffuse, gray surfaces	13.3.1, 13.3.2	HW33: 13.31(P), 13.67	Tu Dec 9
38 W Dec 3	Radiation exchange- two-surface enclosures, radiation shields	13.3.3, 13.3.4	HW34: 13.44	Tu Dec 9
39 F Dec 5	Multimode heat transfer	13.4 – 13.5, 13.7	HW35: 13.72a, 13.84(P)	Tu Dec 9
40 M Dec 8	Radiation review			
41 W Dec 10	Final review			
	W Dec 17	Comprehensive Final Exam (3-6 pm)		

* This schedule and syllabus serve as an outline and guide for our course. I may modify it with reasonable notice to you; changes will be announced in class and posted on Learning Suite.

** Homework is from the 8th edition of the textbook. (P) indicates Practice Problems for which solutions are posted on Learning Suite.

Instructor:	Christopher R. Dillon
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Office:	EB 360F
Phone:	801-422-3650 (office)
Office hours:	MWF 2-2:50 pm M 4-5 pm Th 10-11 am

About me

Favorite author:	Roald Dahl
An old favorite song:	Hoppípolla, by Sigur Rós
A new favorite song:	Good Together, by Lake Street Dive
A favorite scripture:	D&C 90:24
Favorite children:	Claire, Rosalie, Mira, and Benjamin
Favorite sports:	Basketball, ballroom dancing, frisbee, volleyball, baking, kitchen dancing



When

Office hours
My office hours are right before class! If you are unable to meet at that time or would like to meet a different time, feel free to email or drop by my office. If my door is closed, don't hesitate to knock. If another student is already talking to me, and we're jabbering away, make your presence known.

Purpose

Office hours are for YOU! This is time that I have set aside each week to dedicate to helping students. Do not feel like you are taking advantage of my time by coming—that is what the time is for! Don't feel like you need to stop by exactly at the start time—any time during the entire window is fair game. And don't feel pressured into making it quick, especially if no one else is waiting: if you want to spend the whole block of time hashing out some things or getting help for whatever reason, that's okay!

What to discuss

Many think that office hours are only for homework help or if you didn't understand the lecture. That's just the start! You can come into office hours to talk about anything—other things related to the class, other engineering classes, some fun project idea you're thinking about, guidance on picking a research lab, talking about graduate programs or career plans, shooting the breeze about baking, etc. This is your chance to have dedicated one-on-one time with me, regardless of whether it has to do with heat transfer. I love it when students come by, and you should feel comfortable doing so, for whatever reason.

Bonus

Office hours are a good way for me to get to know you. If you end up applying to graduate/law/med school or jobs that require letters of recommendations, I can't really write a good one if you were "just" another student in my class. But if you've come to office hours and given me a chance to get to know you, I can write a better letter for you when it's needed.

Favorite poem

O, one might reach heroic heights
By one strong burst of power.
He might endure the whitest lights
Of heaven for an hour;
But harder is the daily drag,
To smile at trials which fret and fag,
And not to murmur—nor to lag.
The test of greatness is the way
One meets the eternal Everyday.

- Edmund Vance Burke

TA hours

Gaining mastery of heat transfer isn't easy. Along the way, it can be messy and frustrating and very demanding. Don't try to push through alone! TAs can help guide your path through the muck. That's why we have them! The TA office is also a fantastic place to find fellow students grappling with the material. Learn from and teach one another. Effective teamwork is essential for influential engineers.

TA office hours are held in room CB 350. They are posted on Learning Suite under the "Content" tab.

Teagan Matthews

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Emma Bowden

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Muhammad Taha

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**TA Office
CB 350**

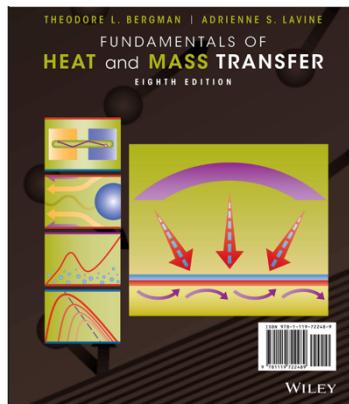
Course Overview

Heat transfer is the study of energy transfer due to a temperature difference, the rates of that transfer, and the resulting temperature distributions. This course is designed to provide advanced undergraduate engineering students with a knowledge and understanding of the fundamentals of conduction, convection and radiation heat transfer modes and of relations used to calculate heat transfer rates.

Textbook

Bergman, Lavine, Incropera, and Dewitt, Fundamentals of Heat and Mass Transfer, Eighth Edition, Wiley, 2011.

- Because the technical content changes very little from one edition to the next students may use the **Seventh** or **Eighth** Edition. However, all sections referenced on the syllabus come from the **Eighth** Edition, and students will be held responsible for content in that edition.
- Those who still need a textbook may purchase a looseleaf copy or rent an Eighth Edition E-book at BYU's My Booklist:
<https://booklist.byu.edu/Home/Mybooklist>



Me En 340 Course Learning Outcomes

- Conservation Principles.* Each student can model heat transfer processes in idealized and practical systems by identifying relevant heat transfer modes and applying conservation of mass and energy.
- Conduction.* Each student can describe the physical mechanisms involved in conduction heat transfer and use Fourier's law to model the conduction heat rate. Each student can apply conservation principles to develop the heat diffusion equation, apply appropriate boundary conditions, solve the heat diffusion equation for simplified scenarios (e.g. lumped/1D/2D, steady/transient, with/without generation) using analytical and/or numerical methods and apply these solutions in appropriate modeling scenarios.
- Convection.* Each student can describe the physical phenomena associated with convection, use non-dimensional parameters and empirical correlations to predict local and global convective heat transfer coefficients for laminar or turbulent flows. Each student can apply Newton's law of cooling to calculate external or internal, forced or free convection heat transfer.

4. *Radiation.* Each student can describe the physical mechanisms involved in radiation heat transfer and apply appropriate relations to model intensity and radiative heat flux to/from a surface. Each student can determine total, hemispherical radiative properties of a surface from spectral, directional quantities and apply appropriate models to obtain the net radiative heat rate at a surface and radiative heat exchange between diffuse, gray surfaces forming an enclosure.
5. *Problem Solving.* Each student can identify heat transfer phenomena in real-world scenarios, use a structured method to define the scenario (e.g. 5 Ps of Problem Definition), apply conservation principles and fundamental laws with appropriate approximations to build a model that represents the scenario, solve the model using a systematic method (e.g., SAFER), and document their analysis/results using an organized structure (e.g., IMRaD) to convey conclusions and recommendations.

Me En 340 Course Expectations

- Attend the lectures, ask questions, give answers! When we do mini reviews or practice problems during lectures, actively work with the people around you. The value of class time increases with the level of your engagement.
- This is a difficult course. To be successful, it will require your consistent and diligent effort. Each reading assignment will take about $\frac{1}{2}$ hour. Homework problems take a significant amount of time to be mastered, so avoid procrastination.
- While difficult, heat transfer is awesome! There are incredible ways that heat transfer affects and enriches our lives. I'm excited to share with you and learn about these things together.
- As you put forth your honest best effort, I will provide every opportunity I can for you to thrive. If you're struggling with an assignment, come talk to me. If you have questions about the reading, come talk to me. If you feel overwhelmed, come talk to me. If you have special circumstances or needs, come talk to me. I want to help you succeed in this course and in your engineering career.
- Finally, I expect personal integrity from my students and myself. I encourage group studying and hope you will collaborate on homework but copying from others or from AI without being intellectually engaged is cheating. I consider using an online or prior semester's solution manual (other than what I post for you on Learning Suite) for Homework Practice or Homework Mastery problems to be plagiarism. This will be considered a violation of the Honor Code. Cheating isn't worth it. Let's work together to learn the material and we can have a great semester.

Course Purpose

Advance along the developmental path from a BYU student to an engineer in the world that solves problems, gives your best, embraces the Holy Ghost, lives authentic discipleship, and finds joy and balance in career, family, social, and gospel living.

Homework

This class has two types of homework: 1. *Practice* and 2. *Mastery*.

Practice problems are intended to help you learn the material but not necessarily to assess your knowledge. To facilitate learning, solutions to Practice problems are posted on Learning Suite. You should attempt these problems on your own or with other students and check the posted solution as a last resort for clues or to confirm that you are doing the problems correctly. Please do not to copy/save the posted Practice solutions. They are only for review as you do the homework.

Mastery problems are intended to assess your ability to apply concepts to new problems. Solutions to the Mastery problems are not posted prior to the due date. You may confer with other students on these problems and with the TA and the instructor if you have a conceptual question. The TA will not show you the key or give answers to these problems so please do not request that.

Homework Practice and Mastery problems are **due at midnight** on the date specified in the syllabus. Your solutions to homework should be orderly and follow a structured format. Scanned copies of both

Practice and Mastery solutions should be uploaded digitally on Learning Suite. Immediately after the due date/time, all homework solutions will be posted on Learning Suite. You will have **48 hours to grade your own homework** following the ME EN 340 Homework Self-Grading Procedure below and to submit a grade under “Homework Report” in Learning Suite. Self-grading helps you learn where you went wrong while the homework is still fresh in your mind.

ME 340 HOMEWORK SELF-GRADING PROCEDURE

Homework solutions will be published on Learning Suite (“Content” tab) immediately after the homework submission deadline. Students should review the posted solutions and grade their own work. Each assigned homework problem should be graded using the following general grading rubric, with **10 points possible for each problem**:

<u>Work</u>	<u>Points</u>
Appropriate schematic with control volume and energy interactions	2
Clearly stated assumptions/approximations	2
Correct use of energy, rate, or other fundamental equations	2
Clear and appropriate solution process	2
Correct numerical answer and units	1
Reflection on solution’s appropriateness and limitations	1

The total score for the assignment should be summed and then input in the “HW XX Report” in the “Exams” tab on Learning Suite. Scoring buttons are listed in 5-point increments (*e.g.*, 5, 10, 15, ..., 50, 55, 60). Input the self-graded total homework score using the buttons, rounded up the nearest 5-point option.

Late Policy

In general, late **Homework** will not be accepted. However, you are allowed **one exception** to submit a late assignment with no penalty. To do so, complete the work when you can and email the scanned copies of your solutions and self-graded score directly to our TA Teagan Matthews (tkm36@byu.edu).

Late **Homework Reports** have their own policy. If you email Teagan your self-graded score with 24 hours of the deadline, there is a 5-point penalty applied to your score. If the score is emailed to Teagan greater than 24 hours from the deadline, a 15-point penalty will be applied.

Portfolios

You will develop two portfolios of heat transfer applications during the course. For each portfolio, you will take identify a real-life heat transfer problem, perform an analysis for the observed heat transfer process, and then present results and a critical evaluation of your solution. More details of the portfolios will be presented in class.

Quizzes

There will be occasional quizzes throughout the semester that emphasize key concepts and prepare you for exams. These quizzes may be given in class, with or without advance notice, or on Learning Suite.

Service

“I have tried to imagine [Jesus Christ] bustling between meetings or multitasking to get a list of urgent things accomplished,” President Dieter F. Uchtdorf said. “I can’t see it. Instead, I see the compassionate and caring Son of God purposefully living each day” (Of Regrets and Resolutions, October 2012 GC). While each of our semesters will unquestionably be busy, it is important to take time for the most important things. I have reduced your Homework load this semester to free up time for service. Details of this assignment will be presented in class.

[Education and service in your 20s leads to a happier, more regret-free life in your 30s](#)

[Service and BYU’s 150th](#)

Exams

There will be two midterm exams and a final exam. The format for each exam will be presented in class. The final exam will be comprehensive on the date shown in the syllabus.

Grades

Total scores for homework, portfolios, and exams are averaged and then weighted by the percentage given below. The grade scale can be found on Learning Suite. Importantly, note that the grade computed on Learning Suite throughout the semester is not predictive of your final grade.

Homework	18%
Portfolios and Quizzes	15%
Service	2%
Exam 1	20%
Exam 2	20%
Final Exam	25%

Honor Code

In keeping with the principles of the BYU Honor Code, students are expected to be honest in all their academic work. Academic honesty means, most fundamentally, that any work you present as your own must in fact be your own work and not that of another. Violations of this principle may result in a failing grade in the course and additional disciplinary action by the university. Students are also expected to adhere to the Dress and Grooming Standards. Adherence demonstrates respect for yourself and others and ensures an effective learning and working environment. It is the university's expectation, and every instructor's expectation in class, that each student will abide by all Honor Code standards. Please call the Honor Code Office at 422-2847 if you have questions about those standards.

What's black and white and goes round and round?

A penguin in a revolving door.

Use of AI

Elder Gerrit W. Gong recently taught, “We are not afraid of artificial intelligence, nor do we think it is the answer to every problem. As we work hard and smart, AI can be a valuable tool to enhance but not replace our own efforts... Artificial intelligence cannot replace revelation or generate truth from God. We have the responsibility to ensure that the Holy Ghost can attest to the truth and authenticity of all we say and share—in our form and in our content. As we seek the Lord’s wisdom and understanding, He will continue to guide and bless us.” ([BYU Devotional](#), 8/19/2025)

You will need to know how to use generative AI software, like ChatGPT, in your engineering career. I want you to learn to use such tools now, so you’re not disadvantaged at graduation. At the same time, I want *you* to learn thermodynamics and how to solve problems. Leaning too much on AI, which can easily solve many of the problems we look at in this class, will impede your growth as an engineer. With that in mind, here are a few principles:

1. You may use generative AI to help you prepare for class, study for exams, and brainstorm for assignments. AI software should not be used to replace course materials such as assigned readings, nor should it be used for reading quizzes.
2. For homework, you may use generative AI sparingly to help you get unstuck. I discourage it though, and prefer you look to the textbook, fellow students, TAs, and my office hours first. Growth comes from overcoming difficult challenges. The work you submit should reflect your intellectual engagement with and understanding of the material. A copy or cut and paste approach from AI is no different than copying from another student. Please don’t do it.
3. Generative AI software may not be used for any purpose in any exam situation.

What do you call a penguin in the desert?

Lost.

Preventing & Responding to Sexual Misconduct

The health and well-being of students is of paramount importance at Brigham Young University. If you or someone you know has experienced sexual harassment (including sexual violence), there are many resources available for assistance.

In accordance with Title IX of the Education Amendments of 1972, BYU prohibits unlawful sex discrimination, including sexual harassment, against any participant in its education programs or activities. The university also prohibits sexual harassment by its personnel and students. Sexual harassment occurs when

- a person is subjected to unwelcome sexual speech or conduct so severe, pervasive, and offensive that it effectively denies their ability to access any BYU education program or activity;
- any aid, benefit, or service of BYU is conditioned on a person's participation in unwelcome sexual conduct; or
- a person suffers sexual assault, dating violence, domestic violence, or stalking based on sex.

University policy requires all faculty members to promptly report incidents of sexual harassment that come to their attention in any way, including through face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Incidents of sexual harassment should be reported to the Title IX Coordinator at t9coordinator@byu.edu or (801) 422-8692 or 1085 WSC. Reports may also be submitted online at <https://titleix.byu.edu/report> or 1-888-238-1062.

BYU offers confidential resources for those affected by sexual harassment, including the university's Sexual Assault Survivor Advocate, as well as non-confidential resources and services that may be helpful. Additional information about Title IX, the [Sexual Harassment Policy](#), reporting requirements, and resources are found at <http://titleix.byu.edu> or by contacting the university's Title IX Coordinator.

What is black and white and black and white?

A penguin rolling down a hill.

Student Disability

Brigham Young University is committed to providing a working and learning atmosphere that reasonably accommodates qualified persons with disabilities. A disability is a physical or mental impairment that substantially limits one or more major life activities. Whether an impairment is substantially limiting depends on its nature and severity, its duration or expected duration, and its permanent or expected permanent or long-term impact. Examples include vision or hearing impairments, physical disabilities, chronic illnesses, emotional disorders (e.g., depression, anxiety), learning disorders, and attention disorders (e.g., ADHD). If you have a disability which impairs your ability to complete this course successfully, please contact the University Accessibility Center (UAC), 2170 WSC or 801-422-2767 to request a reasonable accommodation. The UAC can also assess students for learning, attention, and emotional concerns. If you feel you have been unlawfully discriminated against on the basis of disability, please contact the Equal Opportunity Office at 801-422-5895, eo_manager@byu.edu, or visit <https://hrs.byu.edu/equal-opportunity> for help."

What's black and white and laughing?

The penguin that pushed him.

Devotional Attendance

President C. Shane Reese recently said, "Our BYU devotionals are such an important part of our uniqueness at BYU. They provide us as students, faculty, and staff an opportunity to blend the sacred elements of the restored gospel of Jesus Christ with elements of academic disciplines. Devotionals help each of us to develop our full divine potential, which is central to all that we do at BYU. BYU strives to emit a unique light for the benefit of the world—a light that will enable BYU to be counted among the exceptional universities in the world and an essential example for the world. I love that each of you has made it a priority to participate in our devotional today." (Opening remarks, 5/23/23 Devotional). Your

attendance at each forum and devotional is strongly encouraged. You are welcome to join the faculty each Tuesday (meet at 10:45 am in the Me En front offices) to walk to the Marriott Center and enjoy the devotional together.

To be clear, Dr. Dillon does not condone the pushing of penguins or people.

A Prophetic Message

I hope that you are not afraid of tough classes... I hope that you are not afraid of lengthy periods of preparation... You simply have to apply yourself. I hope that you want to be so well equipped that you can compete in this competitive world. I hope that you will learn to take responsibility for your decisions, whether they be in your courses of study which you elect to take, or whether they be in the direction of the academic attainments which you strive to achieve.

Should you become discouraged or feel burdened down, remember that others have passed this same way; they have endured and then have achieved. When we have done all that we are able to do, we can then rely on God's promised help.

You have access to the lighthouse of the Lord. There is no fog so dense, no night so dark, no mariner so lost, no gale so strong as to render useless the lighthouse of the Lord. It beckons through the storms of life. It seems to call to you and me: "This way to safety; this way to home."

Don't say to yourselves, "I'm not wise enough, or I can't apply myself sufficiently well to study this difficult subject or in this difficult field, so I shall choose the easier way." I plead with you to tax your talent, and our Heavenly Father will make you equal to those decisions.

-President Thomas S. Monson, [Life's Greatest Decisions](#), CES Young Adult Fireside, September 7, 2003