San José State University
Mechanical Engineering Department
ME 114: Heat Transfer – Section 1, Fall 2017

Course and Contact Information

Instructor:	Prof. Kathryn Gosselin
Office Location:	Engineering 310K
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Office Hours:	Tuesdays 10:30-11:30 AM, Wednesdays 1-2 PM, or by appointment. Visit https://goo.gl/oHrh72 to make an appointment.
Class Days/Time:	Tuesdays and Thursdays, 9:00-10:15 AM
Classroom:	Clark Hall 222
Prerequisites:	ME 113 and Math 133A, both with a C- or better
Course Website:	http://connect.mheducation.com/class/gosselin-me114-f17

Proof of Prerequisites

You must submit proof of prerequisites to your instructor by **September 6th**, or you will be dropped from the class. Please submit an unofficial transcript via email or in class with your prerequisite courses highlighted. If your courses are being evaluated for equivalency, please attach a course description to your unofficial transcript. Graduate students may take ME 114 with recommendation from a graduate advisor.

Add Codes

If you would like to add this class, please **email me** your name, SJSU ID, reason for needing an add code, and proof of prerequisites.

Course Format

All lectures will be delivered in class via written notes and occasional PowerPoint slides, which will be posted to Canvas. I will also post grades, homework solutions, and weekly announcements to Canvas, which you are responsible for checking. I strongly suggest having all announcements forwarded to an email address you check daily. To use Canvas, go to http://my.sjsu.edu, click "Canvas," and login with your 9-digit SJSU ID and password.

All homework will be posted, submitted, and graded via a separate online system called McGraw-Hill Connect. You are required to purchase either the bundled book with access code from the bookstore, or purchase just an access code, which gives you access to an e-book. There is a two-week grace period after you register for Connect if you are waiting on financial aid in order to purchase a book or access code. In order to complete homework, you will need regular access to a computer (tablet, laptop, or desktop) with access to the internet. If you are not able to fulfill any of these requirements, please tell me within the **first week** of the semester. To start using Connect, visit http://connect.mheducation.com/class/gosselin-me114-f17**.**

Course Description

Conduction, convection and radiation heat transfer with applications. Analytical, experimental, and computational methods of analyzing heat transfer behavior.

Course Learning Outcomes (CLO)

By the end of the course, each student should demonstrate an ability to

1. Apply the heat diffusion equation to calculate temperature distributions and heat transfer rates in simple geometries.
2. Determine the variation of thermal conductivity between classes of materials (metals, ceramics, and polymers), phases of matter, and with temperature (and pressure for gases).
3. Calculate thermal resistances, including contact resistances, and develop thermal circuits.
4. Analyze heat transfer from finned surfaces.
5. Apply finite difference techniques to compute heat conduction in 1- and 2-dimensional configurations, under steady and transient conditions.
6. State sources of uncertainty in computational fluid dynamics programs and determine ways to improve their accuracy
7. Analyze transient conduction using lumped capacitance and determine when its use is appropriate.
8. Calculate temperatures for transient heat conduction in multi-dimensional geometries where lumped capacitance does not apply.
9. Explain the importance of boundary layers to heat transfer.
10. Explain the importance and source of the convection transfer equations.
11. Explain the significance of non-dimensional parameters such as Re, Pr, Nu, and Sc.
12. Explain the analogy between heat and mass transfer.
13. Use correlations to determine heat transfer coefficients and/or temperatures for external flow over plates, cylinders, and spheres.
14. Use correlations to determine heat transfer coefficients and/or temperatures for internal flow in tubes.
15. Determine conditions under which convection is natural, forced, or mixed.
16. State the main categories of heat exchangers.
17. Determine overall heat exchanger coefficients for heat exchangers using the log-mean-temperature-difference (LMTD) and number of transfer units (NTU) methods.
18. Calculate heat transfer and pressure drop for a heat exchanger given a graph of j and f vs. Re.
19. Explain the differences among intensity, emissive power, radiosity, and irradiation and between spectral and hemispherical.
20. Explain the difference between diffuse and grey.
21. Apply Wien's Displacement Law, the Stefan-Boltzmann Law, band emission, and blackbody functions.
22. Compute the radiative properties emissivity, absorptivity, reflectivity, and transmissivity.
23. Apply Kirchoff's Law.
24. Account for environmental radiation.
25. Compute view factors.
26. Calculate radiation exchange between blackbodies.
27. Analyze radiation exchange between two diffuse, gray surfaces in an enclosure.

ABET Learning Outcomes

This course addresses the following outcomes for our accreditation by the Accreditation Board for Engineering and Technology. Graduates are expected to attain the following outcomes:

a. an ability to apply knowledge of mathematics, science and engineering.
e. an ability to identify, formulate and solve engineering problems.

j. a knowledge of contemporary issues.

Required Texts/Readings

Textbook

Heat and Mass Transfer: Fundamentals and Applications, by Cengel and Ghajar, 4th ed., McGraw-Hill, 2010.

Other Materials

As mentioned above, you must use Connect for homework assignments. An access code comes bundled with the book from the bookstore, or you may purchase access for $100.

Course Requirements and Assignments

Prerequisites

To enroll in this course, you must have complete Math 133A and ME 113, with a C- or better in each.

Expected Time Commitment

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found at http://www.sjsu.edu/senate/docs/S12-3.pdf.

Effort and course performance are strongly correlated. I don't give A's for effort, but putting the time and energy into this class will give you a much better chance of performing well. You should plan to spend 2-3 hours outside of class for every hour of class; for a 3-credit class such as this one, you should expect to spend 6-9 hours outside of class every week. Some students may spend more or less time than this, but this is a good guideline. How you spend this time is dependent on how you best learn, but I would suggest reviewing your notes, reading pertinent sections of the book, doing or redoing homework problems, and completing LearnSmart activities (discussed subsequently).

Class Attendance

NOTE that University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

If you are unable to attend class for any reason, **you are responsible for making up any missed assignments, notes, and quizzes**. I will post all class notes on Canvas.

Homework

There will be 12 assignments throughout the semester. Homework will be assigned every week, and it will be due Tuesday of the following week at 11:59 PM unless otherwise announced. Homework is turned in via the McGraw-Hill Connect website. Each assignment will consist of two required problems and several optional problems. The optional problems are each worth 0 points, and the required problems are each worth 50 points. You must upload handwritten or typed solutions for the two required problems. These uploads must be vertically oriented pictures in PDF format, or you will not get credit. It is your responsibility to make sure that the scanned document is legible. If you are unable to scan and upload these files, you may turn them in during class on Tuesday mornings rather than submitting them online.

A grader will grade the two required problems each week and provide feedback as needed. If you believe that something was graded incorrectly, you must submit a written request for a regrade. You should give me the following either in person or via email:

1. A copy of your original work.
2. A copy of any comments left by the grader.
3. A written explanation of why you think you deserve more points.

The grader and I will evaluate your request and update you on our decision within one week.

No late homework will be accepted without a documented excuse; however, the two lowest homework scores will be dropped.

LearnSmart Exercises

There will be 12 LearnSmart assignments throughout the semester. These are guided readings with theory-based questions, and they reinforce the course material. They are structured so that if you get a question wrong, it will ask you more questions on the same topic until you achieve 100% completion.

The average of all 12 LearnSmart Assignments will be used to assign extra credit as follows:

- 50% or better average: 1 extra credit point
- 75% or better average: 2 extra credit points
- 100% average: 3 extra credit points

These assignments have due dates, and if a LearnSmart assignment is not completed by the due date, it will not count for extra credit. These due dates approximately coincide with our completion of the corresponding material in class.

Exams and Quizzes

Two midterm exams and four quizzes will be given in class. The midterm exams are closed book with an equation sheet allowed. The quizzes are open book with no notes allowed. If you use an e-book, you will be required to face the back of the room while taking the quiz. Without a documented excuse, all exams and quizzes must be taken on the indicated dates. I will post a review sheet for the midterms at least a week in advance of each.

Final Examination

A written final exam will be given at 7:15 AM on Tuesday, December 19th. This will be an open book exam with an equation sheet allowed. The exam will be cumulative, but there will be more emphasis on material learned after the second midterm. I will post a review sheet on Canvas at least two weeks before the final exam.

Grading Information

Grading Philosophy

In engineering, getting the right answer is obviously important, but right now, I am more concerned with helping you become good problem-solvers, not good answer-finders. This means that the process will be weighted more heavily than the exact answer. For any given quiz or exam problem, my *approximate* grading scheme (subject to change, and not applicable to multiple-choice problems!) is as follows:

Getting the correct answer	10%
Using the correct units	10%
Using the correct equations…	40%
…in the correct way.	40%

If you attempt to solve a problem, I will try my best to give you partial credit. The more clearly you write your solution, the better. A good solution contains the following:

- Your name, date, and homework assignment number (when applicable).
- A summary of the problem statement (for homework problems).
- A drawing or illustration of the problem.
- A list of all assumptions.
- Equations written in symbolic form first, before plugging in numbers.
- The final answer indicated clearly, including units.

Grading Policy

A+	97.0-100.0	A	93.0-96.9	A-	90.0-92.9
B+	87.0-89.9	B	84.0-86.9	B-	80.0-83.9
C+	77.0-79.9	C	74.0-76.9	C-	70.0-73.9
		D	60.0-69.9		

*NOTE: I round your grades to one decimal place before assigning a letter grade. For example, a 92.94 is an A-, while a 92.95 is an A.

Homework	15%
Quizzes (4@ 5% each)	20%
Midterms (2@20% each)	40%
Final Exam	25%
LearnSmart Extra Credit	up to 3% bonus

An exceptional final exam (10 or more points higher than your course average going into the final) will result in the final exam being weighted at 35% of the final grade, and the weight of the other items being decreased proportionally. **No extra credit** will be made available beyond what is listed in this syllabus.

Classroom Protocol

Please place your cellphones on silent and refrain from using them during class. If you must take an emergency phone call, please leave the room quietly to do so. Exams and quizzes will be given at the beginning of class, so please be punctual.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/"

"SOS!"

Sometimes, life happens. If you are really struggling with the course material, and/or if something is going on outside of class that may significantly disrupt your studies (financial concerns, upheaval in your home life, physical or mental health issues, etc.), I will do everything I can to help you succeed. If I am personally unable to help you, I will direct you to the appropriate resource. If you aren't comfortable talking to me about a personal issue, that's fine, too! I will maintain a list on Canvas of all the resources available to you as an SJSU student. The earlier you ask for help with a problem, the easier it is to solve.

ME 114: Heat Transfer, Fall 2017
Tentative Course Schedule

Date	Topics, Readings, Assignments, Deadlines	Reading	Assignments
Aug-24	Introduction, Heat Transfer Overview	Chapter 1	
Aug-29	Introduction to Conduction, Heat Conduction Equation	2.1-2.3	
Aug-31	Applying Boundary Conditions	2.4-2.5	
Sep-5	Heat Generation	2.6, 3.1	HW1
Sep-7	Resistance Method	3.3	
Sep-12	Contact Resistance	3.2	HW2
Sep-14	**Quiz 1: Heat Conduction Equation** Cylinder/Sphere Conduction, Fins	3.4-3.5	
Sep-19	Fins (cont'd), Common Configurations	3.6-3.7	HW3
Sep-21	Lumped Capacitance, 1-D Transient Heat Transfer	4.1-4.2	
Sep-26	**Exam 1: Steady State Conduction**		
Sep-28	Semi-infinite Solids, Multi-Dimensional Systems	4.3-4.4	
Oct-3	Steady-State Numerical Methods	5.1-5.4	HW4
Oct-5	Numerical Methods	5.5	
Oct-10	**Quiz 2: Transient Conduction** Introduction to Convection	6.1-6.6	HW5
Oct-12	Convection Governing Equations, Reynolds Analogy	6.7,6.11	
Oct-17	Flow Over Flat Plates	7.1-7.2	HW6
Oct-19	Cylinders and Spheres, Internal Flow	7.3, 8.1-8.4	
Oct-24	Internal Flow (cont'd)	8.5	HW7
Oct-26	Turbulent Internal Flow, Natural Convection	8.6, 9.1, 9.6	
Oct-31	**Quiz 3: External Flow** Heat Exchangers	11.1	HW8
Nov-2	Heat Exchangers (cont'd)	11.2-11.4	
Nov-7	**Exam 2: Convection**		
Nov-9	Heat Exchangers (cont'd)	11.5-11.6	
Nov-14	Introduction to Radiation	12.1-12.4	HW9
Nov-16	Relative Properties, Atmospheric and Solar Radiation	12.5-12.6	
Nov-21	**Quiz 4: Heat Exchangers** View Factors	13.1-13.2	HW10
Nov-23	**NO CLASS – THANKSGIVING**		
Nov-28	Black Surface Radiation Heat Transfer	13.3	HW11
Nov-30	Gray Surface Radiation Heat Transfer	13.4	
Dec-5	Radiation Problem-Solving		HW12
Dec-7	Review		
Dec-19	**FINAL EXAM: 7:15-9:30 AM**		