Syllabus: PHYS 321, *Thermal Physics*
University of Tennessee, Knoxville - Spring 2021

**Lecture Time:** MWF 1:00 - 1:50 PM  
**Lecture Modality:** On-line, Synchronous  
**Lecture Zoom:** https://tennessee.zoom.us/j/98669827284  
**Credit Hours:** 3  
**Prerequisites:** PHYS 136, 138, 231, or 311

**Instructor:** Joon Sue Lee (Physics & Astronomy)  
**Office hour:** After every on-line lecture or by appointment  
**E-mail:** jslee@utk.edu  
**Web page:** www.phys.utk.edu/jslee

**Course GTA:** Andrew Tarrrence  
**E-mail:** dtarrenc@vols.utk.edu  
**Office hour:** By appointment

**Course Objectives:**  
Thermal physics is the study of heat in macroscopic systems containing large numbers of particles. As an entry-level course of thermal physics for undergraduate students, this course will cover concepts of temperature and heat, laws of thermodynamics, and statistical mechanics. We will also discuss applications to physical, chemical and biological problems on the basis of thermodynamics and statistical mechanics. By the end of the course, students in this course will be able to:

- describe concepts of temperature, heat, and entropy.
- understand the laws of thermodynamics and apply them to systems at equilibrium.
- connect microscopic physics to macroscopic behavior of large number of particles.
- use thermodynamics and statistical mechanics to understand physical, chemical, and biological systems.
- understand the basics of quantum statistics and distinguish Bose-Einstein statistics and Fermi-Dirac statistics.

**Main Textbook:** *An Introduction to Thermal Physics* by Daniel V. Schroeder, Addison-Wesley Longman; 1st Ed. ISBN: 978-0201380279 (available in the

**Reference Textbooks:**
- *Fundamentals of Statistical and Thermal Physics* by Frederick Reif
- *An Introduction to Thermodynamics and Statistical Mechanics* by Keith Stowe
- *Thermal Physics* by Charles Kittel and Herbert Kroemer
Topics Covered (chapters from the main textbook)
Chapter 1. Energy in Thermal Physics in week 1 & 2
Chapter 2. The Second Law in week 3 & 4
Chapter 3. Interactions and Implications in week 5 & 6
Chapter 4. Engines and Refrigerators in week 7
----------Midterm Exam covering chapters 1-4
Chapter 5. Free Energy and Chemical Thermodynamics in week 8 & 9
Chapter 6. Boltzmann Statistics in week 11 & 12
Chapter 7. Quantum Statistics in week 13 & 14
----------Final Exam covering chapters 5-7

Grades
Learning outcomes will be evaluated through students’ performance on homework assignments, quizzes, and exams. Students are responsible for reading the material before lectures, doing homework assignments, and keeping up as we go along.

<table>
<thead>
<tr>
<th>Grading Distribution</th>
<th>Grading Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>≥ 90% A</td>
</tr>
<tr>
<td></td>
<td>83 – 86% B+</td>
</tr>
<tr>
<td></td>
<td>73 – 76% C+</td>
</tr>
<tr>
<td></td>
<td>63 – 66% D+</td>
</tr>
<tr>
<td>Quiz</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>87 – 89% A-</td>
</tr>
<tr>
<td></td>
<td>80 – 82% B</td>
</tr>
<tr>
<td></td>
<td>70 – 72% C</td>
</tr>
<tr>
<td></td>
<td>60 – 62% D</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>77 – 79% B-</td>
</tr>
<tr>
<td></td>
<td>67 – 69% C-</td>
</tr>
<tr>
<td></td>
<td>57 – 59% D-</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
</tbody>
</table>

*Scaling may be applied to homework, quiz, and exam.

Homework Assignments
Homework assignments are based on the material covered in the class. Students will learn a lot during the completion of homework assignments. Discussions with students in the course are encouraged. Please take time to demonstrate your own thoughts. Copying solutions of peer students or other available solutions and handing them in as your own is cheating, which results in "F" on the assignment. There will be six homework assignments due on every other Friday at 11:59 PM. Electronic copies must be submitted via Canvas. Late homework may be submitted by the following week with 20% penalty.

Homework Due Dates

Quizzes
There will be four quizzes due on Fridays between homework assignments. Quizzes will be given via Canvas. Access will be open from Thursday evening to the start of Friday class. Questions will be on physical concepts discussed in classes.

Quiz Dates
Quiz1 – 2/12   Quiz2 – 2/26   Quiz3 – 3/26   Quiz4 - 4/16

Exams
There will be two synchronous on-line exams via Zoom. Electronic copies must be submitted on Canvas at the end of the exams. A one-page, hand-written formula sheet will be allowed for both exams. Contact the instructor if makeup is needed.

**Exam Dates**

Midterm exam – 3/12 during class time  
Final exam – 5/5, 8:00 - 10:15 AM

**Attendance Policy**

Regularly attending class is important to be successful in this course. If you have to miss a lecture, please contact instructor for information about what was covered and what was announced. Absence more than 20% of lectures will affect your final grade.

**Announcements**

For announcements, check the “Announcements” on Canvas regularly.

**Policies for Students Who Are Ill or Self-Isolating**

**Classroom Attendance Policy**

If you are feeling well enough, you should continue to attend class. If you are too ill to attend class, your absences will be excused and accommodated only if you have followed the university’s policy on self-isolation. To verify that you are following university policy, you will need to email me a copy of the confirmation email you receive after submitting your self-isolation form. You do not need to provide any personal medical information. You should begin attending class again as soon as you are feeling well enough to do so.

**Make Up/Late Work**

If you are feeling well enough, you should continue to attend class and turn in assignments on time. If you are too ill to complete daily tasks, we will discuss accommodations individually. You should begin attending class again as soon as you are feeling well enough to do so. It is your responsibility to reach out to the instructor once you return to class to set up a time to discuss any needed accommodations.

**Additional information**

Please see the Campus Syllabus, which contains information that is common to all courses at UTK, such as academic integrity and addressing disability needs.

[https://teaching.utk.edu/the-syllabus/](https://teaching.utk.edu/the-syllabus/)