



Your grade will be based on weekly homework problems (40%), warm-ups (10%), two midterm tests (2x10%), and a final test (30%)

## Grading

Late Homework: 15% off per day for the first four days, or until graded (whichever is first).

Thereafter I'll accept (but won't grade) them at any time for 25% credit.

## Homework assignments

In the Assignments folder on the website.

## Final exam

December 10, 2021, 8-11 am

## Students learning outcomes

1. Students will apply laws of thermodynamics to describe thermal properties of macroscopic systems.
2. Students will derive thermodynamic properties of a physical system from partition functions based on microcanonical, canonical, and grand canonical ensembles.
3. Students will be able to compute properties of collective particle systems obeying Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac distributions.
4. Students will be able to explain principles of operation of common heat engines.
5. Students will analyze how quantum effects emerge in classical experiments on thermodynamics of black-body radiation and heat capacities of solid and gaseous materials.

**Masks and other anti-COVID measures** In accord with the SMU policy, all participants are required to wear two-layer face masks for the whole duration of in-person meetings. Vaccination against COVID is strongly encouraged, as well as social distancing in the classroom when possible.

**COVID-19 and Other Medical-Related Absences** Students who test positive for COVID-19 and need to isolate, or who are notified of potential exposure, must follow [SMU's Contact Tracing Protocol](#). To ensure academic continuity and avoid any course penalties, students should follow the same procedures described by their instructors as they would for any other medical-related absence in order to be provided with appropriate modifications to assignments, deadlines, and exams.

<b>Disability Accommodations</b>	Students who need academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit <a href="http://www.smu.edu/Provost/SASP/DASS">http://www.smu.edu/Provost/SASP/DASS</a> to begin the process. Once they are registered and approved, students then submit a DASS Accommodation Letter through the electronic portal, <i>DASS Link</i> , and then communicate directly with each of their instructors to make appropriate arrangements. Please note that accommodations are not retroactive, but rather require advance notice in order to implement.
<b>Sexual Harassment</b>	All forms of sexual harassment, including sexual assault, dating violence, domestic violence and stalking, are violations of SMU's Title IX Sexual Harassment Policy and may also violate Texas law. Students who wish to file a complaint or to receive more information about the grievance process may contact Samantha Thomas, SMU's Title IX Coordinator, at <a href="mailto:acessequity@smu.edu">acessequity@smu.edu</a> or 214-768-3601. Please note that faculty and staff are mandatory reporters. If students notify faculty or staff of sexual harassment, they must report it to the Title IX Coordinator. For more information about sexual harassment, including resources available to assist students, please visit <a href="http://www.smu.edu/sexualmisconduct">www.smu.edu/sexualmisconduct</a> .
<b>Pregnant and Parenting Students</b>	Under Title IX, students who are pregnant or parenting may request academic adjustments by contacting Elsie Johnson ( <a href="mailto:elsiej@smu.edu">elsiej@smu.edu</a> ) in the Office of the Dean of Students, or by calling 214-768-4564. Students seeking assistance must schedule an appointment with their professors as early as possible, present a letter from the Office of the Dean of Students, and make appropriate arrangements. Please note that academic adjustments are not retroactive and, when feasible, require advance notice to implement.
<b>Religious Observance</b>	Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. <a href="#">Click here for a list of holidays.</a>
<b>Excused Absences for University Extracurricular Activities</b>	Students participating in an officially sanctioned, scheduled university extracurricular activity should be given the opportunity to make up class assignments or other graded assignments that were missed as a result of their participation. It is the responsibility of the student to make arrangements for make-up work with the instructor prior to any missed scheduled examinations or other missed assignments. (See <a href="#">2020-2021 SMU Undergraduate Catalog</a> under "Enrollment and Academic Records/Excused Absences.")
<b>Final Exams</b>	Final course examinations shall be given in all courses where appropriate, and some form of final assessment is essential. Final exams and assessments must be administered as specified in the official examination schedule. Exams cannot be administered or due during the last week of classes or during the Reading Period. Syllabi must state clearly the form of the final exam or assessment, and the due date and time must match the official SMU exam schedule. Final exams are not required to be provided online.
<b>Student Academic Success Programs</b>	Students needing assistance with writing assignments for SMU courses may schedule an appointment with the Writing Center through Canvas. Students who would like support for subject-specific tutoring or success strategies should contact SASP, Loyd All Sports Center, Suite 202; 214-768-3648; <a href="https://www.smu.edu/sasp">https://www.smu.edu/sasp</a> .
<b>Caring Community Connections Program</b>	CCC is a resource for anyone in the SMU community to refer students of concern to the Office of the Dean of Students. The online referral form can be found at <a href="http://smu.edu/deanofstudentsccc">smu.edu/deanofstudentsccc</a> . After a referral form is submitted, students will be contacted to discuss the concern, strategize options, and be connected to appropriate resources. Anyone who is unclear about what steps to take if they have concerns about students should contact the Office of the Dean of Students at 214-768-4564.
<b>Campus Carry Law</b>	SMU prohibits possession of weapons (either openly or in a concealed manner) on campus. For more information, please see: <a href="http://www.smu.edu/BusinessFinance/Police/Weapons_Policy">http://www.smu.edu/BusinessFinance/Police/Weapons_Policy</a> .

# PHYS 6351 Syllabus

## Thermodynamics

- Laws of thermodynamics
- Entropy
- Thermodynamic potentials
- Heat engines and refrigerators

## Probability and introduction to statistical methods

- One random variable
- Probability distributions
- Many random variables
- Sums of random variables and the central limit theorem
- Information and entropy

## Kinetic theory of gases

- Liouville's theorem
- The Maxwell=Boltzmann statistics
- The H-theorem and irreversibility
- Conservation laws

## Classical statistical mechanics

- The microcanonical ensemble
- The canonical ensemble
- The grand canonical ensemble

## Quantum statistical mechanics

- Dilute polyatomic gases
- Black-body radiation
- Heat capacity of a solid
- Bose and Fermi statistics
- Quantum microstates and macrostates

## Ideal quantum gases

- Hilbert space of identical particles
- Canonical formulation
- Grand canonical formulation
- Non-relativistic gas
- The degenerate fermi gas
- The degenerate bose gas