

Physics 380: Thermal and Statistical Physics
Gustavus Adolphus College Fall 2021

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Homework help, Q&A, and more: (a.k.a. Office hours)

Monday 9-10am, Wednesday 1:30pm-2:30pm, Friday 1:30-2:30 by appointment and any other time my door is open. **Drop by to talk!**

Course website: Moodle

Textbook:

An Introduction to Thermal Physics, by Daniel V. Schroeder (Addison Wesley, 2000)

Course Description and Objectives:

This course is an introductory treatment to thermal and statistical physics. Thermal physics topics include energy and temperature, entropy and the free energies, and the laws of thermodynamics. Statistical physics topics include distributions, the connection between microscopic laws and macroscopic behavior, and quantum and classical statistics of example systems. In addition to providing students with an introduction to the subject, this course has the broader objectives of prepare students for graduate level courses and study by emphasizing deep conceptual understanding of the material and connections between topics.

Course Policies and Evaluation

- 1. Class Meetings:** During in-person instruction mode, the class will meet on MWF 10:30-11:20. Students are expected to have read the material to be covered before coming to class.
- 2. Homework:** Problems sets will be assigned roughly weekly. Written homework sets should be neat and organized. Legibility and thorough explanations of answers are required and will be considered in the grade. Although you are allowed to discuss and work problems with each other (with equal effort), and encouraged to discuss with the instructor, **it is vital that you realize the importance of individual effort in completing your homework.** (Also see the academic honesty policy.)
- 3. Late Homework: Homework is due at the beginning of class on the date assigned.** One late homework assignment will be accepted, up to 48 hours late, without penalty. Subsequent late assignments will begin with an increasing penalty of 25%, 50%, 75%, and 100% (no credit) accruing at the beginning of class time plus an additional 25% every 24 hours thereafter.
- 4. Attendance:** Students are expected to attend all classes during the scheduled hours. Students are responsible for informing themselves of material and assignments covered during absences. Students must advise the instructor in writing during the first week of class of any scheduled athletic, music, or other college activities that will require their absence during the semester. Such written notice does not imply a waiver of course requirements or an agreement to reschedule exams.
- 5. Exams:** There will be three one-hour exams, and a two-hour written final exam. Quizzes will be given at the discretion of the professor. There will be no separate mid-term exam.
- 6. Missed Exams:** Students are expected to arrange in writing with the instructor more than one week in advance to take an exam at other than the announced time. Requests to reschedule exams for non-emergency personal reasons (e.g. plane tickets, not-prepared, oversleeping) will be declined. Permission

to make up a missed exam after the fact will be at the discretion of the instructor and will generally be granted only for emergency reasons.

7. Academic Honesty: You will abide by the academic honesty policy printed in the Academic Bulletin and abide by decisions of the joint student/faculty Honor Board. **The use of internet solutions or answer books (including parts of problems) or parasitizing (including copying) other students for any assignment, quiz, or exam, unless specifically stated otherwise, is not allowed, and will result in a zero for the entire assignment, quiz, or exam and reporting to the dean of students as a minimum penalty.** It is your responsibility, as a student, to ask questions if you are not sure about what constitutes academic honesty in any other aspect of this course. Severe (even on the first incidence) or repeat offenders risk a grade of failing for the entire course at the instructor's discretion.

8. Incompletes: An incomplete will only be given if, after the last day to withdraw has passed, unforeseen circumstances beyond the student's control (usually restricted to illness or emergency) preclude completion of the **remaining** work for the course by the end of the semester. Note that poor planning or having a lot of work to complete at the end of the term are not considered circumstances beyond a student's control. (College policy)

9. Requesting Accommodations: Gustavus Adolphus College is committed to ensuring the full participation of all students in its programs. If you have a disability and anticipate or experience barriers to equal access, please speak with the accessibility resources staff about your needs. A disability may include mental health, attentional, learning, chronic health, sensory, physical, and/or short-term conditions. Course requirements cannot be waived, but reasonable accommodations may be provided based on disability documentation and course outcomes. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact the Academic Support Center as early as possible. The Accessibility Resources Coordinator can provide further information.

10. Recording: Students must request written permission from the instructor to record (audio or video) any component of this class (including in-person or online). Any recording that includes other students will require that the class be notified by the instructor or that those present give consent. By coming to, and remaining in class, it is assumed you give your consent to be recorded.

11. Posting of course videos and materials: Recordings and videos of the class, as well as those produced as part of class instruction (including excerpts, clips, etc.) and materials (including assignments, solutions, graded materials, etc), are not to be reproduced or posted in any format or on any platform or distributed in any way without the written consent of the instructor.

12. Copyright: Some class materials may be copyrighted. Access to these materials is restricted to students registered for the class. These materials may not be reproduced, shared, or distributed by students. If a tutor needs access to these materials in order to provide you with academic support, please ask your instructor for assistance.

13. Evaluation: Hour exams 40%, Homework 30%, Final Exam 30%. Final course grades will be assigned using the following scale as a guide:

94-100 A	82-86 B	70-74 C
90-94 A-	78-82 B-	66-70 C-
86-90 B+	74-78 C+	0-66 F

Assignment of the final letter grades will also take into account other factors including the instructor's subjective evaluation of the student's attendance, initiative, evidence of improvement, and the quality of independent work.

PHY-380 Thermal and Statistics Schedule 2021 – Subject to Change

S (Schroeder) G&T (Gould and Tobochnik) – section coverage

CH. X – homework due

Wk/Mo	Monday	Wednesday	Friday
1 / Sept 8 – 10		Intro S: 1.1-1.2	Equipartition S: 1.3-1.5
2 / Sept 13 – 17	Enthalpy S: 1.5-1.7	Binomial Distribution G&T: 3.5	Ch. 1 Probability Distributions G&T 3.6
3 / Sept 20 – 24	Central Limit Theorem G&T 3.7-3.9	Einstein Model S: 2.1-2.3	Ch. 3 G&T Large Systems S: 2.4
4 / Sept 27 – Oct 1	Ideal Gas S: 2.5	Counting stats Ideal Gas S: 2.5	Entropy S: 2.6
5 / Oct 4 – 8	Ch. 2 Temperature S: 3.1	Nobel Conference	Exam 1 Chapters 1-2 + G&T
6 / Oct 11 – 15	Entropy and Heat S: 3.2	Paramagnetism S: 3.3	Pressure S: 3.4
7 / Oct 18 – 22	Chemical Potential S: 3.6	Heat Engines S: 4.1	Ch. 3 Refrigerators S: 4.2-4.4
8 / Oct 25 – 29	Fall Break	Free Energy 1 S: 5.1	Ch. 4 Free Energy 2 S: 5.2
9 / Nov 1 – 5	Exam 2 Chapters 3-4	Phase Transformations S: 5.3	Free energy problems Catch up day
10 / Nov 8 – 12	Boltzmann Statistics S: 6.1	Average Values S: 6.2	Ch. 5 Equipartition S: 6.3
11 / Nov 15 – 19	Maxwell Distribution S: 6.4	Partition Function S: 6.5-6.7	Ch. 6 Gibbs Factor S: 7.1
12 / Nov 22 – 26	Exam 3 Chapters 5-6	Thanksgiving	Thanksgiving
13 / Nov 29 – Dec 3	Quantum Statistics S: 7.2	Fermi Gas S: 7.3	Fermi Gas 2 S: 7.3
14 / Dec 6 – 10	Blackbody radiation S: 7.4	Ch. 7 Debye Model S: 7.5	BEC S: 7.6
15 / Dec 13 – 15	TBD	Ch. 7 part 2 TBD	

COVID Information:

All classrooms will follow the most up-to-date COVID policy of the college with regard to masking, social distance, food and beverage in the classroom, and sanitizing of technology and spaces. **Individual faculty members may ask for additional COVID precautions at their discretion.**

It is the policy of Gustavus Adolphus College that all students must abide by rules and standards designed to protect the community. Refusal to comply with any COVID related rules will be handled through the student disciplinary sanction process and will be reported to the Office of Student Life.

- Upon the first and second offense of a failure to abide by COVID rules, I will ask you to leave, and you will not be invited back on that day. You will receive a score of zero for any daily class activity including possible penalty in the final grade.
- Upon the third offense, I will ask you to leave, and you will fail the class.

Masking

When required by Gustavus or government mandate, correctly positioned face masks (covering both your nose and your mouth) must be worn and will be enforced as described above. **When not required by Gustavus or government mandate, it is the expectation in this classroom that masks will still be worn during high local levels of transmission.**

Food and Beverages

No food will be permitted in classrooms unless there is a medical accommodation. Beverages will be permitted in classrooms, but students may only remove face coverings briefly during the time when they are actually drinking, if necessary. **Overuse of the drinking privilege may be considered a violation of the masking policy.**