Physics 306: Thermodynamics and Statistical Physics

Welcome to Thermodynamics and Statistical Physics at Stony Brook University. A study of the fundamental concepts of thermodynamics, kinetic theory, statistics, and statistical mechanics. Topics include the thermodynamics of simple systems, kinetic theory of gases, probability theory and statistics, statistical mechanics of gases, and an introduction to quantum statistics.

This syllabus may be modified by the instructor if necessary.

University Catalog	Physics 306 Credit hours 3
Prerequisite	Prerequisite: PHY 251, 277, 300. Math proficiency in introductory calculus is essential. If you are uncertain about your preparation, consult the instructor.
Instructor	Dr. Felix Ringer Office: C-137 (Physics) Phone: (631) 632-8125 email: felix.ringer@stonybrook.edu
Website	We will be using *Brightspace* for our course website.
Classes	Classes: Tuesday, Thursday: 2:00 pm - 3:20 pm Location: Psychology A 137 Each class period will consist of lectures and interactive discussion. If you must miss a class, it is your responsibility to find out what you missed. Handwritten lecture notes will be uploaded on *Brightspace*. However, these notes are not a book and are not a substitute for going to class. My recommendation is to take notes in class.
Office Hours	Tuesday at 11:00 am in my office, Physics C-137, and by appointment.
TA	Pubasha Shome, pubasha.shome@stonybrook.edu Office Hours: tbd, Physics A-129.
Materials	Textbook (required): "*Concepts in Thermal Physics*" by Blundell and Blundell (second edition). Another optional textbook is *"An Introduction to Thermal Physics"* by Schroeder
Reading	It is strongly recommended to read the textbook (see above) in parallel to the lecture. Sometimes, you may be given specific reading assignments.

Homework

- *Physics is best learned by attempting to solve problems.* Assignments will be given via *Brightspace* every week (typically Wednesdays). They are due in a week, or as specified. Homework will be submitted via *Brightspace*.
- *Late homework submissions:* Homework can be accepted late but will be penalized at 5% per day. The last day for late submissions is when the solutions will be uploaded to Brightspace. This is typically one week after the 'regular' deadline.
- *How to submit:* Students will need to produce a scan (of reasonable quality) of their weekly homework and submit it electronically as a single pdf document. Individual jpegs and other formats will not be accepted. For most students, the app *CamScanner*, which can be installed on any modern phone, is a useful tool to scan handwritten pages and convert them to a single pdf document. This can be submitted to *Brightspace*.

Course outline

We will cover all or a subset of the following topics:

1. Math introduction
2. Classical thermodynamics
3. Laws of thermodynamics
4. Equations of state, Maxwell relations
5. Probability theory & statistics
6. Statistical mechanics
7. Ensembles and partition functions
8. Classical and quantum gases
9. Heat capacities
10. Van der Waals and real gases

Exams

This course will contain one midterm in-class examination and a comprehensive final exam. If you must miss an exam, contact the instructor as soon as possible. Written makeup exams will not in general be offered, except at the discretion of the instructor. One page (front and back) of *hand-written* notes (*formula sheet*) will be allowed for the exams, which needs to be submitted together with your exam solutions.

The exam schedule is as follows:

- Final Exam: Tuesday, May 19th, 2:15 am - 5:00 pm
- Midterm Exam: Tuesday, March 24th, 2:00 – 3:20 pm

Grades

A letter grade will be assigned at the end of the course based on numerical scores obtained from the midterm and final exams, and homework

assignments. The grading will be based *roughly* on the following table. The contribution from each these to the final grade is as follows:

- Midterm Exam: 30%
- Final Exam: 45%
- Homework: 25%

I reserve the right to change these proportions (within reasonable limits) as the course progresses to provide the best overall assessment of the class as a whole. My intent of course is to follow these guidelines.

Required e-mail communication

Email to your University email account is an important way of communicating with you for this course. For most students the email address is firstname.lastname@stonybrook.edu. It is your responsibility to read your email received at this account.

Student Accessibility Support Center

f you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suit 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation are confidential.

Academic Integrity

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology and Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website
at http://www.stonybrook.edu/commcms/academic_integrity/index.html