



## Course Information

- **Course number and title:** PHYS 515 Thermal and Statistical Physics
- **CRN:** 53914
- **Meeting day(s) and time(s):** T, Th 12:00 pm - 1:15 pm in PHYS 338
- **Instructional Modality:** Face-to-Face (in-person)
- **Course credit hours:** 3
- **Prerequisites:** Undergraduate level PHYS 31000 or PHYS 41000 Minimum Grade of D- and Undergraduate level PHYS 34200 or 34400 Minimum Grade of D- and Undergraduate level PHYS 36000 or 46000 or 55000 Minimum Grade of D- and Undergraduate level PHYS 33000 or 43000 Minimum Grade of D-

## Instructor(s) Contact Information

- **Instructor:** Prof. Arnab Banerjee
- **Office Location:** PHYS 168
- **Office Phone Number:** 765-494-3028
- **Purdue Email Address:** [arnabb@purdue.edu](mailto:arnabb@purdue.edu) (contact by email preferred)  
Emails are read 8 a.m. to 5 p.m. daily and will be responded to within 24-36 hours. *Subject line of email must always start with PHYS 515.*
- **Office hours:** Wednesdays 10:00 AM - 11:00 AM. In-person meetings accepted in PHYS 168. Also available to meet on Webex with prior appointment: <https://purdue.webex.com/meet/arnabb>
- **Meet me online:** [www.vyte.in/banerjee](http://www.vyte.in/banerjee)
- **Teaching Assistant:** Sharmin Aktar Lima
- **Purdue Email Address:** [lima6@purdue.edu](mailto:lima6@purdue.edu)
- **Office hours:** TBD

## Course Description

The course provides a thorough introduction to the foundations of thermal physics: Equilibrium states, the concept of heat, and the laws of thermodynamics; the existence and properties of entropy and free energies; different thermodynamic potentials and their uses; phase diagrams and phase transitions; introduction to statistical mechanics and its relation to thermodynamics; treatment of ideal gases.

## Learning Resources, Technology & Texts

- **Required textbook:** An Introduction to Thermal Physics by Daniel V. Schroeder (2021)  
We will closely follow the textbook. Reading the textbook is mandatory. A tentative schedule for lectures is provided in the course schedule with the expectation that you will read those chapters of the text before coming to the lecture. The pre-class reading introduces the material; the lecture elaborates on the reading and addresses potential difficulties. Finally, the text serves as a reference and a study guide. You are responsible for reading the entire covered material. You should also consider the textbook as just the starting point of your study. In addition to the above-mentioned textbook there are endless resources online starting from Wikipedia. The answer to your questions may be just a quick search away.
- **Other textbooks consulted:**

- Statistical and Thermal Physics, Charles Kittel and Herbert Kroemer
  - Statistical Mechanics, Shang Keng Ma,
  - Statistical and Thermal Physics, with Computer Applications, Gould and Tobochnik
  - Entropy, Order Parameters and Complexity, J.P. Sethna
- **Brightspace learning management system:** Course materials will be posted on Brightspace:  
<https://purdue.brightspace.com/>  
 Access the course via Purdue's Brightspace learning management system. Begin with the Start Here tab, which describes how the course in Brightspace is organized. It is strongly suggested that you explore and become familiar not only with the site navigation but with the content and resources available for this course. See the Student Services widget on the campus homepage for resources such as Technology Help, Academic Help, Campus Resources, and Protect Purdue.
  - **Lectures:** You are responsible for attending all lectures. If you miss a lecture, it is your responsibility to learn what you missed. We will make every effort to make the lecture notes available for download on Brightspace as soon as possible after the lecture.

## Learning Outcomes

By the end of the course, you will be able to:

1. Understand and describe a wide range of physical phenomena in Statistical and Thermal Physics using fundamental principles.
  - Methods of Evaluation: Exams, Homework
2. Model thermal phenomena quantitatively.
  - Methods of Evaluation: Exams, Homework
3. Apply learned concepts to a range of related topics.
  - Methods of Evaluation: Exams, Homework

## Assignments

Your learning will be assessed through a combination of homework, two mid-term exams, and a final exam spread throughout the academic period. Details on these assignments and exams, including a schedule of due dates, will be posted on the course website.

Assignments	Due	Points
Homework	Throughout the semester	50%
Mid-term exam 1	March 6, 8 – 10 pm, BRNG 2290	20%
Final Exam	To be announced	30%

- Homework: Homework assignments will be posted roughly every week and sometimes every two weeks on Brightspace. You will have one week to turn in the homework. Deadline will be typically on Sunday at 11:59 pm ET (this may change during the semester). Only reasonable requests for extension will be entertained. Homework turned in after 24 hours after the deadline will be worth 75% credit. Homework turned in between 24 hours after the deadline, but before solutions are posted, will be worth 50% credit. Homework turned in after solutions are posted are worth 0%. Homework solutions must include complete, legible explanations of your work. It must be easy for the reader to follow your reasoning.
- Mid-term exams: There will be a mid-term exam. These will consist of questions/problems that require hand-written answers detailing each step of your solution. ~~The exams will be open book.~~ More details will be sent in a Brightspace announcement before the exam.

- Final exam: This will be a comprehensive final exam (date to be announced) posted on Brightspace. This will consist of questions/problems that require hand-written answers detailing each step of your solution. The final exam will be open book. More details will be sent in a Brightspace announcement before the exam.

## Grading Scale

In this class grades reflect the sum of your achievement throughout the semester. You will accumulate points as described in the assignments portion above, with each assignment graded according to a rubric. At the end of the semester, final grades will be calculated by adding the total points earned and translating those numbers as a percentage into the following letters. There will be no rounding of the percentages. If you receive an 89 % score, you are guaranteed an A-. Typical grades are below. Typically I have seen that folks who do well in assignments get good grades.

A+: 95 % and above  
 A: 92 % - 94.99 %  
 A-: 89 % - 91.99 %  
 B+: 85 % - 88.99 %  
 B: 82 % - 84.99 %  
 B-: 79 % - 81.99 %  
 C+: 75 % - 78.99 %  
 C: 72 % - 74.99 %  
 C-: 69 % - 71.99 %  
 D+: 65 % - 68.99 %  
 D: 62 % - 64.99 %  
 D-: 59 % - 61.99 %  
 F: 58.99 % or below

Incidents of academic misconduct in this course will be addressed by the course instructor and referred to the Office of Student Rights and Responsibilities (OSRR) for review at the university level. Any violation of course policies as it relates to academic integrity will result minimally in a failing or zero grade for that assignment, and at the instructor's discretion may result in a failing grade for the course. In addition, all incidents of academic misconduct will be forwarded to OSRR, where university penalties, including removal from the university, may be considered.

Students can report issues of academic integrity that they observe, and may do so anonymously, through the OSRR by calling 765-494-8778 or emailing [integrity@purdue.edu](mailto:integrity@purdue.edu).

## Attendance Policy

This course follows Purdue's academic regulations regarding attendance, which states that students are expected to be present for every meeting of the classes in which they are enrolled. Attendance will be taken at the beginning of each class and lateness will be noted. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to the instructor is not possible, the student should contact the instructor as soon as possible by email or phone. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases falling under excused absence regulations, the student or the student's representative should contact or go to the [Office of the Dean of Students \(ODOS\) website](#) to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted **by ODOS** for cases of grief/bereavement, military service, jury duty, parenting leave, or emergent or urgent care medical care.

For missed exams, an excused grade or make-up exams may be provided at the discretion of the instructor. Documentation regarding the reason for absence will be required.

## Academic Integrity

All students are expected to uphold Purdue's Honor Pledge: "As a Boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing [integrity@purdue.edu](mailto:integrity@purdue.edu) or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace table of contents, under University Policies.

## Nondiscrimination Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach their potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in our course Brightspace under University Policies.

## Accessibility

Purdue University is committed to making learning experiences accessible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: [drc@purdue.edu](mailto:drc@purdue.edu) or by phone: 765-494-1247.

## Mental Health/Wellness Statement

**If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [WellTrack](#).** Sign in and find information and tools at your fingertips, available to you at any time.

**If you need support and information about options and resources,** please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

**If you find yourself struggling to find a healthy balance between academics, social life, stress, etc.** sign up for free one-on-one virtual or in-person sessions with a [Purdue Wellness Coach at RecWell](#). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at [evans240@purdue.edu](mailto:evans240@purdue.edu).

**If you are struggling and need mental health services:** Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

## Basic Needs Security

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency assistance from the [Critical Needs Fund](#)

## **Emergency Preparation**

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructor or TA via email or phone. You are expected to read your @purdue.edu email on a frequent basis and always keep your cell phone on to receive a Purdue ALERT text message.