

# PHY 4513 – Thermal & Statistical Mechanics

## Course Information

- **Course Number and Title:** PHY 4513 – Thermal and Statistical Mechanics
- **Credit Hours:** 3
- **Academic Term:** Spring 2026

## Instructor Information

- **Instructor:** Dr. Nathan Dawson
- **Office Location:** BARC 2267
- **Office Hours:** Monday – 10:00am-10:50am  
Monday – 11:00am-11:50am  
Wednesday – 11:00am-11:50am
- **Email address:** ndawson@floridapoly.edu

## Course Delivery and Course Description

- **Delivery Mode:** Face-to-face lecture
- **Class Meeting Day:** Monday/Wednesday/Friday
- **Time & Location:** 1:00pm-1:50pm, BARC 1123
- **Course Website:** Canvas
- **Official Catalog Course Description:** This course will cover topics in thermodynamics from a primarily statistical mechanics viewpoint. Systems containing large numbers of particles will be analyzed using Boltzmann statistics. The relations between the various free energies, partition functions, and equations of state will be explored. Mathematical topics including probability, statistics, and differential equations, will be used.
  - **Course Prerequisites:** PHY 3101 and MAP 2302
  - **Communication/Computation Skills Requirement (6A-10.030):** N
- **Required Texts:** Daniel Schroeder, *An Introduction to Thermal Physics* (2000)
- **Required Materials:** Notepad for whiteboard instruction, online access to Canvas, and scientific calculator without access to a network and without the ability to upload/download information to a computer.

## Course Objectives and Outcomes

- **Course Objectives:**  
Upon successful completion of this course, you should be able to
  - **Define** the laws of thermodynamics, Maxwell's relations, Boltzmann statistics, and quantum statistics.
  - **Develop** skills to describe and investigate thermal and statistical mechanics phenomena.
  - **Demonstrate** an understanding of concepts surrounding thermal and statistical physics.
  - **Solve** thermal and statistical mechanics problems systematically using the fundamental principles of thermal and statistical physics.
- **Course Learning Outcomes:**

Course Learning Outcome	Program Learning Outcome (ABET, GenEd, Other)
<b>Demonstrate</b> skills required to manipulate thermal and statistical physics equations.	1
<b>Apply</b> principles of thermal physics to investigate microscopic and macroscopic systems and processes.	1
<b>Connect</b> mathematical formulas to the underlying physics.	7
<b>Solve</b> problems encountered in thermal and statistical physics.	1, 7

## Academic Support Resources

- **Library:** Students can access the Florida Polytechnic University Library through the University website and [Canvas](#), on and off campus. Students may direct questions to [library@floridapoly.edu](mailto:library@floridapoly.edu).
- **Peer Learning Strategists (PLS):** Are specially trained student leaders who help their peers strategize approaches to course content and work through solution methods. PLS work in collaboration with the courses they support so the content and methods are aligned with your instructors' expectations. Students can meet with a PLS in The Learning Center, which is located on the first floor of the Innovation, Science and Technology (IST) building in room 1019.
- **Academic Success Coaches:** All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center:** Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit <https://floridapoly.edu/writingcenter>.

## Civility and Collegiality

Faculty and students come to the university for the same reason, which is to participate in a highly professional educational environment. To that end, both students and faculty are expected to treat each other with mutual regard and civility. Communication, written, oral and behavioral, between faculty and students must remain respectful. Within and outside of the classroom, students must refrain from derogatory comments toward the faculty member and their fellow students, and faculty as well must refrain from derogatory comments toward their students. Faculty and students should address each other with respect, in accordance with the wishes of the faculty and the students: for example, no one should be addressed by their last name alone.

Faculty from the outset of a course can and should specify what constitutes activities and behavior that take away from, that diminish, the educational environment. An individual student's distracting behavior impedes the education of fellow students, which itself is a form of disrespect. Civility and collegiality also include respecting each other's time: for example, neither students nor faculty should arrive late to class (unless unforeseen, pressing circumstances prevail); faculty should be present at the posted office hours; and students and faculty should be punctual when meeting times are scheduled. In more general terms, collegiality means respecting the right of both faculty and students to participate fully and fairly in the educational enterprise.

## Course Policies

### Attendance

- **Attendance:** Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor.
- **Excused Absences:**  
Students with excused absence are allowed reasonable time to make up the missed works without any reduction in the assigned work or final course grade as a direct result of the absence. Absences from class are excused for any of the following reasons: *religious observances of student's faith, legal responsibilities (jury duty, court obligations), military obligations, university-sponsored events, death or serious illness within the student's immediate family, or student's own illness, or other reasonable circumstances.*

### Participation

Students are expected to participate in the classroom experience. The use of earbuds/headphones during class is specifically not allowed and students who engage in this behavior may be asked to leave the class for the day (noting exceptions for authorized accommodations). In addition, students who routinely do not bring materials to class that are required for participation, will not be given credit for class attendance, and if this becomes a pattern of behavior, may be asked to leave the class for the day. Persistent problems with participation may result in a [code of conduct](#) referral.

## Late Work/Make-up work

Typically, late or make-up work is not accepted; however, the instructor may decide to accept late or make-up work on a case-by-case basis in accordance with university policy.

## Grading Scale

Grade	A	A-	B+	B	B-	C+	C	C-	D	F
Percentage	> 93%	90%-92%	87%-89%	83%-86%	80%-82%	77%-79%	73%-76%	70%-72%	60%-69%	< 60%
GPA	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.0	0.0

## Assignment/Evaluation Methods

A student's class grade will be determined by performance on assignments and tests weighted according to:

<b>Exam 1</b>	<b>13%</b>
<b>Exam 2</b>	<b>13%</b>
<b>Exam 3</b>	<b>13%</b>
<b>Homework</b>	<b>26%</b>
<b>Attendance</b>	<b>5%</b>
<b>Final Exam (Comprehensive)</b>	<b>30%</b>
<b>Total</b>	<b>100%</b>

**Homework Assignments:** Weekly homework questions will be assigned. The problems will cover the material presented in the book and/or lecture. Each problem will be graded on a 4.0 scale, where 4.0 = 100%, 3.0 = 85%, 2.0 = 75%, 1.0 = 65%, and a 0.0 = 0%. The homework will be averaged at the end of the course and assigned a linearly interpolated percentage score from the listed scale. All relevant workings must be shown

**Regular Exams:** Two regular exams will be administered. These exams cover problem-solving and conceptual understanding. Information about each exam will be given in the weeks prior to the exam. Unless otherwise specified, the final exam and all in-class exams are closed book exams. No notes or other resources such as calculators are allowed unless otherwise specified. Absolutely no use of cell phones during these exams.

- For missed exams, make-up work is at the instructor's discretion. Decisions will be made on a case-by-case basis in accordance with university policy. It is your responsibility to be present for all exams. If you require ODS accommodations, remind me in the week prior to the exam. You are responsible for making arrangements with the Office of Disability Services.

**Final Exam:** The final exam is mandatory and comprehensive. Final Exam cannot be substituted by any of the previous exam or homework scores. Final exam questions will be designed to allow students to demonstrate that they have mastered the various segments of the course and that they are also be able to combine their knowledge of these segments to work more comprehensive problems. The final exam will be administered during the final's week as per the Academic Calendar.

**Lecture Expectations:** Lecture meets for 50-minutes, three times a week (unless otherwise specified by the academic calendar). The intent of lecture time is for you to develop your conceptual understanding, work on representing physical situations, improve your observation and thinking skills, and participate in problem-solving. The lecture will be interactive - you are expected, at appropriate times, to work with your neighbor, express your thoughts, ask and answer questions, discuss ideas, patiently listen to and respect other's ideas.

**Classroom Rules:** Cell phones must be on silent/mute mode and should not be used to the extent that they disturb other students or distract from class participation.

**CANVAS Policy:** Assignments, announcements, and information will be posted on CANVAS. Students are responsible for checking CANVAS regularly to be aware of their assignments and other class information.

**Email policy:** All students are required to use the studentuserID@flpoly.org email system to communicate with the instructor.

**Late Work/Make-up work:** All class assignments will have due dates communicated at the time of assignment. Typically, late or make-up work is not accepted; however, the instructor may decide to accept late or make-up work on a case-by-case basis in accordance with university policy. It is the student's responsibility to know the deadlines and turn work in ON TIME.

## University Policies

## Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The University, through the Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations.

If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the [ODS student portal](#) and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive.

If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible.

The Office of Disability Services (ODS):  
DisabilityServices@floridapoly.edu  
(863) 874-8770  
The Access Point  
[ODS website: www.floridapoly.edu/disability](http://www.floridapoly.edu/disability)

## Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See [University Policy](#).)

## Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. You may speak to your professor, but your professors have an obligation to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University [Ombuds Office](#), BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at [Peace River Center](#), 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The [Title IX Coordinator](#) is available for any questions to discussion [resources and options](#) available.

## Academic Integrity

The faculty and administration take academic integrity very seriously. Violations of [academic integrity regulation](#) include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in an academic integrity hearing and sanctions against the accused student if found in violation. Sanctions range from receiving a zero on the exam or assignment, to expulsion from the university. Repeat offenders are subject to more severe sanctions and penalties.

## Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action).

*Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is **prohibited**.*

## Tentative Course Schedule

Tentative Course Schedule					
Week Topic	Monday	Tuesday	Wednesday	Thursday	Friday
1/12-1/16	Syllabus + Ch 1		Ch 1		Ch 1
1/19-1/23	MLK Jr. Day		Ch 1 HW1		Ch 1
1/26-1/30	Ch 1		Ch 2 HW2		Ch 2
2/2-2/6	Ch 2		Ch 2 HW3		Ch 2 Review (Ch 1-2)
2/9-2/13	Exam 1 (Ch 1-2)	Career Day	Ch 3		Ch 3
2/16-2/20	Ch 3		Ch 3 HW4		Ch 3
2/23-2/27	Ch 4		Ch 4 HW5		Ch 4
3/2-3/6	Ch 4		Ch 4 Review (Ch 3-4) HW6		Exam 2 (Ch 3-4)
3/9-3/13	Ch 5		Ch 5		Ch 5
3/16-3/20	Spring Break				
3/23-3/27	Ch 5		Ch 5 HW7		Ch 6
3/30-4/3	Ch 6		Ch 6 HW8		Ch 6
4/6-4/10	Ch 6 / Ch 7		Review (Ch 5-6) HW9		Exam 3 (Ch 5-6)
4/13-4/17	Ch 7		Ch 7		Ch 7
4/20-4/24	Ch 7 / Ch 8		Ch 8 HW10		Ch 8
4/27-5/1	Ch 8 Course Review	HW11 @11:59pm	Reading Days		
5/4-5/8	Cumulative Final Exam (Ch 1-8)				

**KEY:**

38 Lectures

3 Reviews

11 Homework due dates

3 Exams