Physics
Adelphi University

0156-263-001 **CLASS MEETING TIME 8 – 9:15 pm MW**
Introduction to Statistical Mechanics
Spring Semester 2021
Professor Matthew Wright
Blodgett Hall, Room 002A and Zoom Via: https://us02web.zoom.us/j/8900613436
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Office hours: M 10-12, W 9-11, F 11-12
Note: Feel free to come by at other times or make an appointment if necessary. Officially, questions via email will be answered within 24 hours. I will do my best to answer them ASAP.

SYLLABUS

TEXTS:

Statistical and Thermal Physics with Computer Applications. H. Gould and J. Tobochnik
ISBN: 978-0-691-13744-5

Other resources:

You will need access to MATLAB. *This software can be found in the computer lab in the physics main office.* However, students should consider purchasing the student version of this software. You will program.

COURSE DESCRIPTION AND PURPOSE:

No official description listed.

Students will develop a comprehensive background in statistical physics that will connect macroscopic behavior (e.g., phase transitions, Bose-Einstein Condensation) to its underlining microscopic physics (e.g., quantum mechanics, Newtonian dynamics). Students will explore these physical concepts by comparing the theoretical treatment of statistical physics to numerical calculations written by the students and other authors.

GEN ED LEARNING GOALS/DISTRIBUTION REQUIREMENTS:

N/A

COVID STATEMENT:

Until Covid appears to be under control, we will meet online during class times. If for some reason, we can begin meeting in person as the semester goes along, there will always be an online version of the class.

COURSE PREREQUISITES:

None officially.

Unofficially, 0156-301

COURSE OR MATERIALS FEES:

N/A

SCHEDULE (* subject to change):

There are three sections for this course:

- Thermodynamics (Chapter 1-2) Exam – 2/26/2021
- Stat Mech. Mythology (Chapter 4) Exam – 3/26/2021
- Stat Mech. Applications (Chapters 5-9) – Final Exam Period

COURSE LEARNING GOALS:

- **Organized knowledge:** Students should be able to articulate in their own words the big ideas from each chapter, section, and/or lecture (i.e., the items listed in the Topics section of this syllabus), thus indicating that they have organized their content knowledge. They should be able to filter this knowledge to access the information that they need to apply to a particular physical problem, and make connections/links between different concepts.

- **Problem Solving:** Students will develop skills in analytic problems solving and related critical thinking skills.
    - **Problem-solving techniques:** When faced with a math problem, choose and apply appropriate problem solving techniques. Transfer the techniques learned in class and through homework to novel contexts (i.e., to solve problems which do not map directly to those in the book). Justify selected approach (see "Communication" above).
    - **Problem-solving strategy:** Draw upon knowledge and skills to attack a problem even when a process leading to a correct solution is not yet clear. Continue to develop the ability to monitor progress towards a solution by learning how to:

        1. Backtrack and try a new approach when necessary
        2. Recognize when a solution has been reached and be able to articulate why this solution is valid (see "Expecting and Checking Solution" below)
        3. Persist through to the solution of problems requiring many steps

- **Communication.** Students should be able to justify and explain their thinking and/or approach to a problem or physical situation, in either written or oral form.

- **Intellectual maturity:** Students should accept full responsibility for their own learning. They should be aware of what they do and do not understand about physical phenomena and classes of problem. They should learn to ask sophisticated, specific questions. Students should learn to identify and articulate where in a problem they experienced difficulty and to take appropriate action to move beyond that difficulty. Finally, they should regularly check their understanding against these learning goals and seek out appropriate help to fill in any gaps.

- **Build on Earlier Material:** students should recognize and make use of connections to prior work and all foundation classes.

- **Traditional Statistical Mechanics Learning Goals** taken from [Fazleev, Texas Arlington]
  "Upon completion of the course, the instructor would like to have students clearly understand basic principles, be able to see relationships between ideas, and be able to use principles and ideas to calculate properties of simple statistical systems. Students will learn different statistical ensembles, their distribution functions, ranges of applicability and the corresponding thermodynamic potentials, apply classical and quantum distributions in circumstances varying from standard examples …, learn relationship between equilibrium distributions and kinetic processes leading to equilibrium, and become aware of the richness and complexity of statistical behavior exhibited by interacting systems and various approaches (phenomenological and microscopic) developed to comprehend such systems."

STUDENTS WITH DISABILITIES:

If you have a disability that may significantly impact your ability to carry out assigned coursework, please contact the Student Access Office (SAO) at 516-877-3806 or send an email to sao@adelphi.edu. The staff will review your concerns and determine, with you, appropriate and necessary accommodations. Please allow for a reasonable time frame for requesting ASL Interpreters or Transcription Services.

HONOR CODE STATEMENT:

Students enrolled in this course are expected to abide by the Adelphi University Honor Code. The purpose of the Honor Code is to protect the academic integrity of the University by encouraging consistent ethical behavior in assigned coursework by students. Following is excerpted from the Student Honor Code:

The Code of Academic Honesty
The Code of Academic Honesty prohibits behavior that can broadly be described as lying, cheating, or stealing. Violations of the Code of Academic Honesty will include, but not be limited to, the following:

1. Fabricating data or citations
2. Collaborating in areas not approved by the professor
3. Unauthorized multiple submission of one's own work
4. Sabotage of others' work, including library vandalism or manipulation
5. Plagiarism
6. The creation of unfair advantage
7. The facilitation of dishonesty
8. Tampering with or falsifying records
9. Cheating
10. Other forms of academic dishonesty

TURNITIN:

Adelphi University has a license agreement with Turnitin.com, a service that helps prevent plagiarism from Internet resources. I reserve the right to request an electronic copy of any written assignment submitted in this course for review through Turnitin.com. Please see Adelphi's tips for students on preventing plagiarism and student instructions for Turnitin.com for more information."

STUDENT COURSE EVALUATIONS:

During the last two weeks of the class, you will receive notification, via email and eCampus, that the course evaluation is available for your input electronically.

Availability will end at the start of the final examination period. Your feedback is valuable and I encourage you to respond. Please be assured that your responses are anonymous and the results will not be available to the instructor until after the end of the semester and therefore after course grades have been submitted.

Additionally, feel free to provide feedback to the instructor on the one minute paper that will be handed out during most classes. Please do not include your name on this feedback.

MOODLE:

The syllabus, homework (and solutions), microlectures, and practice tests (and solutions) will be posted on Moodle. You can find out how to use moodle by using the following link: http://fcpe.adelphi.edu/moodle/student/.

If the University is closed for more than two days due to an emergency, log onto this course site under the MOODLE tab in eCampus each day for instructions and assignments. Student tutorials for using MOODLE can be found at http://fcpe.adelphi.edu/moodle/student/

ASSIGNMENTS/COURSEWORK:

Homework:

Homework sets will be provided online Friday of each week by 4:15 pm. These homework sets will be due exactly one week later on Friday's class at 1:00 pm. The day and time may change where appropriate. You may skip one homework set without affecting your grade. Students are encouraged to work in groups and to seek outside help where appropriate; however, they must write (or type) their homework sets individually in a neat concise manner.

Each homework problem will count as 3 points. A nearly correct solution will give you 3 points. A reasonable effort will give you 2 points. Some kind of attempt will give you 1 point. If no attempt is made, you will not receive any points for the question. Those who work through and understand their homework are most likely to succeed on the exams.

Exams:

Likely to be nuts! Expect hard exams that challenge. Team work will be necessary.

Final Exam:

Final exam is cumulative

Classwork:

Each class will have

- Readings
- Pre-class video
- Pre-class assignment (This is will be counted.)
- Document/worksheet to drive discussions
- Numerical assignments will be sprinkled in through the semester and will be fair game for exams.

Group Projects:

Group projects are an opportunity for students to use the concepts they develop in class. Students will be asked to work in groups of two or three to solve some complex problem relating to the class. Students will develop and execute a model, analyze the data, and report their results (3-4 pages, a sample will be provided). Students will have two weeks to solve the problem. Students need to only provide a single paper for each team. There will be about four of these.

GRADING/EVALUATION:

Grades:	Homework	15%
	Exam I	10%
	Exam II	16%
	Mini Group Project	8%
	In Class Activities	15%
	Final Project	20%
	Final Exam	16%

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Percentage	95	90	87	84	79	75	71	65	60	55	50	

ATTENDANCE POLICY:

You are strongly encouraged to come to each class. There numerous reasons you may miss class (e.g., illness, conferences), therefore you can miss up to one without it counting negatively toward your grade. If you expect to miss a large number of classes, please contact the instructor as soon as possible.