

Spring 2018 Physics 362 Section 001 CRN 42015

Professor

Dr. Jared Workman

Class Location

WS 202

Class Hours

2:00-3:15 T Th

Final

Tuesday, May 8th 1:00-1:50

Text Book

Statistical and Thermal Physics with Computer Applications, Harvey Gould and Jan Tobochnik, Princeton University Press

Course Website

<http://org.coloradomesa.edu/~jworkman/teaching/spring18/362/index362.php>

The syllabus will be posted here.

Welcome to Physics 132

Statistical and thermal physics describe systems that contain large numbers of individual constituents. Typical examples are gases and solids, which contain large numbers of identical atoms or molecules. The goal of thermal physics is to describe these systems in terms of bulk macroscopic quantities, such as temperature and pressure. The goal of statistical physics is to relate the bulk description to microscopic descriptions of the system constituents. Averaging over microscopic properties such as kinetic energies or dipoles moments of individual molecules or atoms can yield bulk properties such as temperature or magnetization. Statistical physics and thermodynamics have been developed to the point where a wide range for phenomena can be described using the same small set of general principles. These subjects form a cornerstone of current physics and are frequently used in condensed matter physics, atomic and molecular physics, astrophysics, chemistry and elsewhere. Phys 362 will introduce you to the framework and techniques of statistical and thermal physics as well as illustrating its applications throughout the physical sciences

What We Will Cover

1. Microscopic and macroscopic systems, thermodynamic systems and states, thermodynamic equilibrium.
2. First law of thermodynamics, second law of thermodynamics, energy, heat capacities, enthalpy, entropy.
3. Thermodynamic processes, entropy, heat engines.
4. Fundamental thermodynamic relations.
5. Probability, microstates/macrostates, thermodynamic ensembles.
6. Statistical mechanics.
7. Magnetic systems.
8. Classical ideal gases, Bose and Fermi gases.
9. Chemical potential.
10. Applications of thermodynamics and statistical mechanics.

Here is CMU's course catalog description:

From the catalog...

Phys 362

Study of the physics of bulk matter. Fundamental principles of quantum mechanics, statistical methods employed to explain macroscopic laws of thermodynamics to make detailed predictions about the largescale behavior of solids, liquids, and gases. Applications: specific heat of solids, thermal radiation, magnetic susceptibilities, stellar equilibrium, and chemical reactions. Prerequisites: PHYS 230 or CHEM 321; and MATH 236 or MATH 260.

What to look for in this syllabus

- How to contact me
- Evaluation (grades)
- Late or missed work/exams
- Homework
- Exams
- Resources for student assistance
- Student Conduct
- Important Dates
- Student Learning Outcomes, Program Level Outcomes
- Work load expectations

How to Contact Your Instructor

Visit my office: WS 230C

Office Hours: M/W/Th 10:00-11:00, T 1:00-2:00, F 12:00-1:00

Email me at: jworkman@coloradomesa.edu

Evaluation

Homework 40%

Exams 30%

Final Exam 30%

Grading

Grades will be assigned as follows:

Excellent	A	> 90%
Good	B	80%-90%
Average	C	70%-80%
Deficient	D	60%-70%
Failing	F	< 60%

A curve **may be used** at the end of the semester. I can be contacted at any time to give you an update of your current grade.

Late or Missed Work/Exams

Late Work is not accepted. Missed exams will be automatically assigned a grade of zero. I can be contacted PRIOR to an assignment/exam date if flexibility is needed however any missed work will require documentation to be excused.

Homework

• There will be roughly one assignment per 1-2 weeks consisting of approximately 4-10 homework problems per assignment. Assignments are to be turned in during class on the date due. An assignment not done by the beginning of class

is considered late for the day and will be penalized 25% for that day. Each following day the assignment is not handed in by 2:00 PM it will accrue a further 25% late penalty.

- You are encouraged to discuss homework problems with your classmates. Working problems with your peers is an excellent learning method, however, anything turned in must be your own work. If you have worked with other students at the blackboard and I see identical solutions the credit will be split amongst the participants. Ex – 100 percent correct with 2 identical solutions = 50% per student, with 3 participants = 33% per student.
- Homework is worth 40% of your grade.
- There are a great deal of freely available solutions to everything in almost any book on the internet. Speaking from experience, you won't pass the tests if you copy solutions. The homework IS the place you'll really learn. If you hand in obviously copied solutions the penalty for the first offense will be a zero grade and a report to the office of academic affairs, the penalty for the second offense will be failing the course. If the copying is egregious on the first offense a grade of zero may be assigned for the entire class at my discretion. If you use solutions as a guide you should come to me beforehand and have me look over the homework before handing it in. Note – a very easy way for me to tell who is copying is if you skip steps that you obviously can not.
- Do not use online integrators or canned table solutions to integrals, work them out entirely, this is to help not punish you.
- Write only on one side of each sheet of paper, keep your work neat and understandable.
- I will not grade all problems assigned however I will hand out solutions, the problems I grade will be random so skipping problems is a bad choice.

Exams

There will be 2-3 exams. They will count for 30% of your grade.

The final exam will be cumulative and count for 30% of your grade.

Exams may not be missed although if you contact me before hand I will try to accommodate you in re-scheduling them for family emergencies or experiences beyond your control. Exam dates will be announced in class. All missed exams not excused by the professor will receive a grade of zero and the rules for units and problem solving will be the same as for homework.

You are expected to know all the topics covered in each section. You are EXPECTED TO READ THE BOOK. This statement seems self evident to me but apparently is not obvious. Make sure you can follow through and understand every example in every chapter we cover. Failure to do so will likely result in a poor grade.

Resources for Students

Your instructor: I am here to help you learn; please let me know if you are having trouble with anything! My contact information is at the top of the syllabus, or you can talk to me after class or during my office hours.

The Course Website: Contains all class information and several helpful (and some just fun) links.

Tutorial Learning Center: HH113 <http://www.coloradomesa.edu/tutoring/index.html>

Students With Disabilities: Students with disabilities have certain privileges extended to them including but not limited to extended exam time. It is your responsibility to contact the EAS (Educational Access Services)

At Houston Hall, Room 108, 1-970.248.1856 <http://www.coloradomesa.edu/eas/links.html> and bring me the necessary forms for any special dispensations received.

Class Policies

All students expected to follow the Student Code of Conduct. Violations of the Student Code of Conduct may result in disciplinary action. The code of conduct is here here http://www.coloradomesa.edu/academics/policies/academic_integrity.html. Some specific items that are important in this class are:

1. Don't call me mister, it's Dr. Workman.
2. Create and sustain a respectful and quiet learning environment. Allow your fellow students to learn and the instructor to teach. Disrespectful, disruptive or abusive behavior toward an individual or group is unacceptable. If you are disruptive to your classmates or to me, I will dis-enroll you from the course.
3. Due to the rapid pace of this course, late work is generally not accepted. In the event of illness, family emergency or other special circumstances, you must contact me BEFORE the deadline to make arrangements for late work or early tests. At the instructor's discretion, you may then turn in the work within 1 week of the deadline.
4. I encourage participation, ask questions, email me, ask for reading material for your own edification after the course is over, provide me with feedback. I am not directly grading you on participation but it will play a factor in the end of the semester grade. This is an interesting topic and I want you to be involved in learning it.
5. Turn off your cell phone.
6. No smart phones, ipads, earphones, etc during class time, no texting or web browsing. You all get one freebie phone ring then I may ask you to leave. I reserve the right to temporarily or permanently remove a student for the continued disruptive use of electronic equipment.
7. Laptops are fine for note taking but please do not web surf during class. If I find you surfing the web you forfeit your laptop privileges. Students using laptops are required to sit at the front of the class.
8. I will turn any students I find cheating, copying each other's work, or plagiarizing material over to the department chair, no exceptions. If you are unsure if something is prohibited, ask me. You are encouraged to work together but please do not hand in identical assignments, they will not be accepted.
9. Please arrive to class on time and wait until class is over to leave. I will remove students who regularly arrive late from the course.
10. It is your responsibility to learn of any missed work.
11. Don't talk during class, raise your hand whenever you want to but don't talk. I reserve the right to remove you from the class for the day or completely dis-enroll you from the course for talking during lecture.
12. I do not answer emails where the information can be found on the course website or in this syllabus.

Important dates:

<http://www.coloradomesa.edu/registrar/dates.html>

Disclaimer: The instructor reserves the right to modify this syllabus and schedule.

Student Learning Outcomes

The learning outcomes for this course are as follows. A student who has taken this course will demonstrate the ability to:

1. Translate between verbal and mathematical descriptions of physical situations. Apply mathematical reasoning, using algebra, trigonometry and calculus, to analyze these situations.
2. Apply the First Law of Thermodynamics (including enthalpy and free energies) to thermodynamic situations.
3. State and use fundamental thermodynamic identities (e.g. temperature in relation to entropy and internal energy), via derivatives and differentials.
4. Apply the First and Second Laws of Thermodynamics to analyze thermodynamic process and heat engines.
5. Determine and use probabilities to relate thermodynamic variables to internal microscopic states of systems.
6. Distinguish between and use Boltzmann, Bose-Einstein and Fermi-Dirac statistics.
7. Use the partition function to determine thermodynamic quantities.

Program Learning Outcomes

This course contributes to the fulfillment of the following program learning outcomes for the BS in Physics degree. A student will have demonstrated the ability to:

1. Show fluency with the major fields of physics (classical mechanics, electromagnetism, statistical physics and quantum theory).
2. Use mathematical representations to analyze physical scenarios. This requires translating back and forth between physical and mathematical problems and using appropriate mathematics to aid in the analysis of the scenario.

Work Load Expectations:

An undergraduate student should expect to spend on this course a **minimum** of two hours outside the classroom for every hour in the classroom. The outside hours may vary depending on the number of credit hours or type of course. More details are available from the faculty member or department office and in CMU's Curriculum Policies and Procedures Manual. In reality I'd expect you will spend 10-15 hours a week on this particular class if you expect a decent grade.

Disclaimer:

The instructor reserves the right to modify the schedule and syllabus. It is tentative based on class progress.