

Physics 4315 Section 001
Fall 2016, Science Hall, Room 125
Time: TuTh 11:00 a.m. - 12:30 p.m.
Textbook: Ashley H. Carter, "CLASSICAL & STATISTICAL THERMODYNAMICS"
1st Edition, Prentice-Hall, 2001

Instructor: Joseph Ngai **Email:** jngai@uta.edu **Office:** Science Hall 120F **Phone:** 817-272-2032

Office hours: TuTh 12:30 pm to 2 pm, or by appointment.

Faculty Profile: <https://www.uta.edu/mentis/profile/?11464>

Description of Course Contents: PHYS 4315 covers an introduction to Classical Thermodynamics and Statistical Mechanics. Topics covered include equations of state, First Law of Thermodynamics, reversible/irreversible processes, enthalpy, heat capacity, Second Law of Thermodynamics, Carnot cycle, heat engines and refrigerators, Gibbs and Helmholtz free energies, Maxwell's relations, chemical potential, kinetic theory of gases, equipartition theorem, thermodynamic probability, Schrödinger particle in a box, density of states, Boltzmann and Maxwell-Boltzmann distributions, Boltzmann equation of entropy, Fermi-Dirac, Bose-Einstein statistics, etc.

Student Learning Outcomes: At the end of the course, students should be able to [i] explain the topics covered in the course description; [ii] work thermodynamic and statistical mechanics problems given in the homework; [iii] understand how macroscopic thermodynamic quantities can be derived from statistical assumptions of the microscopic mechanisms governing large systems.

Other Requirements & Course Prerequisites: PHYS 3313 and MATH 2326, or instructor's consent.

Additional Helpful Textbooks:

1. Sears & Salinger, "Thermodynamics, Kinetic Theory and Statistical Thermodynamics", 3rd Edition, Addison-Wesley, 1975.
2. Mandl, "Statistical Physics", 2nd Edition, Wiley, 1988.

Grading:

Attendance	5%
Homework	20%
Midterm 1	20%
Midterm 2	20%
Final	35%

Homework: An assignment will be given every week or so, that covers the topics that are discussed in class. All work must be done by hand on paper and handed in by the due date to obtain credit. Hints to the homework will be given in class. Solutions to the homework assignments will be posted on the wall outside the lecture hall.

Description of Examinations: The 2 midterms and final exam will be comprised of short-answer questions and derivational type problems, similar in style to homework questions. Exams are closed

book, and aids such as calculators and other electronic devices (cell phones, tablets, laptops etc.) are **not** permitted unless told otherwise. A standard formula sheet will be given to each student at the beginning of each exam.

Midterm 1: Chapters 1-7

Midterm 2: Chapters 8-14

Final: Comprehensive, Chapters 1-17 (Tuesday, December 13, 2016, 11:00 am – 1:30 pm)

Policy on missed exams: No make-up exams will be given except in the case of extreme medical emergencies, which will require a Doctor's note.

Attendance: Attendance will be taken randomly 3 times during the semester. If found absent, 1.7 % will be taken off your final grade for each instance (i.e. total of $3 \times 1.7\% = 5\%$ off final grade if found absent all 3 times). You can avoid having marks deducted for absences simply by emailing me prior to or immediately after a missed lecture.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>). Last day to drop: November 2nd, 2016.

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX: The University of Texas at Arlington is committed to upholding U.S. Federal Law "Title IX" such that no member of the UT Arlington community shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity. For more information, visit www.uta.edu/titleIX.

Academic Integrity: Students enrolled in this course are expected to adhere to the UT Arlington Honor Code: *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence. I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.* UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an

examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located to your right or left as you exit the lecture hall. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

Course Schedule:

September:

- Ch. 1: The Nature of Thermodynamics
- Ch. 2: Equations of State
- Ch. 3: The First Law of Thermodynamics
- Ch. 4: Applications of the First Law
- Ch. 5: Consequences of the First Law

October:

- Ch. 6: The Second Law of Thermodynamics
- Ch. 7: Applications of the Second Law
- Ch. 8: Thermodynamic Potentials
- Ch. 9: The Chemical Potential and Open Systems
- Ch. 10: The Third Law of Thermodynamics

November:

- Ch. 11: The Kinetic Theory of Gases
- Ch. 12: Statistical Thermodynamics
- Ch. 13: Classical and Quantum Statistics
- Ch. 14: The Classical Statistical Treatment of and Ideal Gas
- Ch. 16: The Heat Capacity of a Solid

December:

- Ch. 17: The Thermodynamics of Magnetism

As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.