

Physics 4315 Section 001
Fall 2018, Science Hall, Room 330
Time: MoWe 1:00 p.m. - 2:20 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: MoWe 2:30 pm to 3:30 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 (Wednesday, December 12, 2018, 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: At the University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I have established the following attendance policy: **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. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

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://web.uta.edu/aao/fao/>). **Last day to drop class:** Friday Nov. 2, 2018.

Disability Accommodations: UT 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)*, *The Americans with Disabilities Amendments Act (ADAAA)*, and *Section 504 of the Rehabilitation Act*. 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 disability. Students are responsible for providing the instructor with official notification in the form of a **letter certified** by the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting: **The**

Office for Students with Disabilities, (OSD) <http://www.uta.edu/disability/> or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability/.

Counseling and Psychological Services (CAPS) www.uta.edu/caps/ or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

Non-Discrimination Policy: The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos.

Title IX Policy: The University of Texas at Arlington (“University”) is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit www.uta.edu/titleIX or contact Ms. Michelle Willbanks, Title IX Coordinator at (817) 272-4585 or titleix@uta.edu*

Academic Integrity: Students enrolled all UT Arlington courses 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 in their courses by 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. Additional information is available at <https://www.uta.edu/conduct/>. Faculty are encouraged to discuss plagiarism and share the following library tutorials <http://libguides.uta.edu/copyright/plagiarism> and <http://library.uta.edu/plagiarism/>

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>.

Campus Carry: Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

Student Feedback Survey: At the end of each term, students enrolled in face-to-face and online classes categorized as “lecture,” “seminar,” or “laboratory” are 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 via the SFS database is aggregated with that of other students enrolled in the course. Students’ anonymity will be protected to the extent that the law allows. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: for semester-long courses, a period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring](#), [major-based learning centers](#), developmental education, [advising and mentoring](#), personal counseling, and [federally funded programs](#). For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at <http://www.uta.edu/studentsuccess/success-programs/programs/resource-hotline.php>

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 down the stairwell immediately to the left of the classroom**. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

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
- October 24, Midterm 1

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

November 28, Midterm 2

Ch. 14: The Classical Statistical Treatment of an 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. – Joseph H. Ngai

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381