



# Phys 535: Thermodynamics: Analysis and Applications

COURSE SYLLABUS: Spring 2025

Course Time Zone: Central Time USA

## INSTRUCTOR INFORMATION

Instructor: Dr. Kurtis A. Williams, Professor & Department Head

Preferred Pronouns: He/him/his

Office Location: Room 106A, McFarland Science Building

Online Office Hours: I will schedule 1 hour twice a week during which you can ask questions live via the video conferencing service Zoom. I will try and schedule one during a weekday evening and one at a weekend. These will be scheduled taking into account your availability; you will complete a poll during the first week to determine the best times. Additional Zoom meetings are available by appointment.

University Email Address: [Kurtis.Williams@tamuc.edu](mailto:Kurtis.Williams@tamuc.edu)

Preferred Form of Communication: **email**

**In emails**, please put "PHYS 535 Online" in the subject header. I will reply to emails within 24 hours (48 at weekends and holidays). **Note:** *I will exclusively use your Leomail university email addresses for email communication.*

Office Phone: (903) 886-5488

Communication Response Time: Before the end of the following business day

## COURSE INFORMATION

### Materials – Textbooks, Readings, Supplementary Readings

#### Textbook(s) Required

- Schroeder, V. Daniel. (1999), *An Introduction to Thermal Physics*, Addison-Wesley, ISBN-10: 0201380277, ISBN-13: 978-0201380279
  - The required book can be ordered from online retailers for generally less than \$100, and half that for ebook formats.

#### Course Prerequisites

**Math:** Students are required to know mathematics through Calculus 3 or equivalent, or have taken or be currently taking *Mathematical Methods for Educators Course* (PHYS 530). We'll be making extensive use of algebra, basic differentiation and integration,

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and some partial differentiation and multiple integration. Use of the natural logarithm, exponential functions and partial differentiation will be used VERY extensively.

**Physics:** A course in calculus-based physics (sometimes called University physics) is required.

### **Course Description**

Thermodynamics is the study of the flow of heat between physical systems, and the effects of those flows. It encompasses the variety of ways one can compress, expand, heat and cool fluids and solids, and the ways in which one can extract or impart energy to systems. The most immediately practical application of thermodynamics involves the quantification of the amount of useful energy (work) a system can impart, a consequence that led, upon the scientific development of thermodynamics, directly to the industrial revolution and the modern world. In doing so, the far-reaching concept of entropy is introduced, the quantification of the amount of energy not available to do work - the amount of disorder in a physical system.

Kinetic theory and statistical mechanics seek to derive the laws of thermodynamics from more fundamental considerations of the underlying motions and energy states of the microscopic constituents of the system. Due to the fact that most physical systems are made up of far too large a number of constituents to describe each one individually, statistical methods have to be employed. The distribution of velocities and, more generally, energy states, among the constituents can be described mathematically described and hence the average properties of the constituents as a whole can be derived and macroscopic quantities such as pressure emerge.

The purpose of this class is 2-fold:

1. To give you a working knowledge of thermodynamics, kinetic theory and statistical mechanics, and their context and importance.
2. To discuss the teaching of these at a high school level, examine common misconceptions, explore the many tools available on the web that aid us, and to share experiences and resources as a community.

### **Student Learning Outcomes**

At the end of the course:

1. Students will be able to correctly define energy, heat, functions of state and other thermodynamic quantities.
2. Students will be able to correctly apply the first law of thermodynamics in problems, analyze the commonly used intuitive description of the meaning of entropy, and discuss improvements to that description.
3. Students will be able to correctly apply the second law of thermodynamics in problems.
4. Students will be able to apply the statistical description of velocities of atoms and molecules to derive the pressure of a fluid and its effusion, diffusion and viscosity coefficients.

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5. Students will be able to construct the simple partition functions of physical systems and use it to derive thermodynamic quantities and analyze physical systems.
6. Students will know the misconceptions encountered when teaching thermodynamics and statistical mechanics, and devise strategies to counter them that can be implemented in lesson plans.

## COURSE REQUIREMENTS

### Instructional Methods / Activities / Assessments

The details of the course structure are given below. Any changes will be communicated via email and announcements on MyLeo Online (D2L). Your leomail email account will be used at all times, and it will be your responsibility to check it regularly (at least once every 24 hours).

#### Course structure

The course is divided up into 4 units, each containing 3 weeks. Although I refer to them as weeks, some of them span two weeks worth of time. For example, the first “week” lasts from Jan 13<sup>th</sup> – Jan 31<sup>st</sup>, to give us time to ease into the class! If in doubt, consult the class schedules at the end of the syllabus. Each unit covers a major topic in thermodynamics or statistical mechanics. At the end of each unit will be a “catch-up” week to draw breath, complete tutorial homeworks and assessments, and take stock before the next major topic.

Each week’s material becomes available at **12.01 a.m.** on a Friday. Although each week has its associated assignments, I will also make all reading and tutorials/tutorial homeworks available in a separate module from the start of the semester.

Each week you will watch 1-3 mini-lectures, do selected readings from the textbook and complete the various assignments listed below.

#### Introductory tasks

The semester starts at **12.01 a.m. Monday, January 13th** which is when the introductory material and Unit 1 will become available.

**Before tackling Unit 1 and the rest of the course**, you must complete the following activities which you can find in the introductory module:

1. Read the **syllabus**
2. Take the **syllabus quiz** to make sure you understand the mechanics of the course. This can be taken *any number of times*. The **syllabus quiz** will not be included in your grade, but it must be completed *with 100% correct answers* before you are permitted to move on to Unit 1.
3. **Introduce** yourself to the class on the “**Class Introductions**” discussion thread.
4. Create your account on **Perusall** (link given in email and D2L).

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5. Complete the availability survey to set Zoom office hours (link given in email and on D2L).

**NOTE: You must complete the syllabus quiz with 100% correct answers before you will be able to access the first, and subsequent, units.**

## **Learning Activities and Assessments**

The following describes the assignments you must complete which will contribute to your progress through the course and to your final grade, together with how they will be assessed. There are strong similarities with assessments in other classes in the program, but also some important differences in the details.

**Perusall assignments:** Perusall is an online system that enables students and instructors to collectively discuss a text as they read. We will be using Perusall for reading assignments and to work collaboratively on tutorials. See schedule at the end of the syllabus and in Perusall itself for the schedule of assignments. You make annotations (notes) as you read to share your thoughts, write questions, and collaborate on discussing and answering tutorial questions. You can respond to each other and upvote each other. Like the discussion forums, I will also contribute.

**Submitting non-Perusall assignments:** Homework that involves problem solving, pictures, or other material that is difficult to submit as a Word format or similar, may be submitted as hand written work scanned in or photographed. If you use a camera phone to take pictures of your work, a useful app is CamScanner (<https://www.camscanner.com>), which compiles multiple pictures into one document for ease of uploading. There is a free version that I encourage you to check out. It is your responsibility to make sure that your work is legible. You will upload your assignment to D2L under the relevant assignment. Do NOT upload multiple jpg or pdf files – make sure each assignment is a single file.

**Quizzes** are designed to assess students' comprehension of the reading assignments, mini-lectures and basic knowledge of key principles, often in response to the mini-lectures and reading assignments.

Quizzes are designed to provide you with assessment of your learning. Half of the quiz grade will be awarded just for completing the quiz; the other half will come from your actual quiz score.

**You will only be able to take quizzes once. Once you begin taking the quiz, you will have a time limit of one hour to complete it. Once completed, you cannot return to it and revise your answers. You will see your score, however, and which answers you got wrong.**

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*Quizzes address: Learning Outcomes 1-5*

**Ongoing Discussions** will be conducted each week on the concepts introduced in the reading material and lectures. A number of threads will be opened on particular topics. Sometimes I will ask a question or pose a problem to get you started.

Learning and understanding is significantly enhanced by active engagement in the class through continual discussion of topics. All students are required to participate in the discussions with a number of substantive posts. **Students are required to make 2 substantive posts, in three separate threads, giving your thoughts about the reading or answering the opening questions. In addition, students are required to make one post in the *previous week's* threads, replying to posts of other students or of myself. That makes a total of 3 posts per week that will be graded.**

Of course, continued discussion beyond the minimum posts required is strongly encouraged. I will pitch into the discussion at various times during the week, answering queries and asking new questions to make sure we discuss all the week's material adequately.

When appropriate, at least one thread will be devoted to discussing how one might teach the week's concepts at the undergraduate level, and for the sharing of your own experiences and resources for the benefit of the teaching community. I hope to make the discussion threads a fun and lively forum throughout the semester!

*Discussions address: Learning Outcomes 1-6*

### **Reading assignments (on Perusall)**

There will be 12 reading assignments. These are research papers on how students learn specific concepts in thermodynamics and statistical mechanics, and suggestions for teachers on how to approach teaching the topics. I can see how much of the paper you have read and how much time you have spent reading. I will introduce the reading with some prompts to set the discussion going.

*Reading assignments address: Learning Outcome 6*

### **Tutorials (on Perusall)**

Tutorials are designed to take students step-by-step through a topic with the aim of learning the concepts at a deep level. 12 tutorials will be assigned throughout the semester. You should work through the tutorials on your own. **Do not use Perusall to write in all your answers.** Perusall will be used to collaborate by you asking questions, offering potential solutions and constructively analyzing and assessing each others work, building on each others thoughts to reach a complete understanding. You will often need to use math in your comments on Perusall. There are two ways to do it. Perusall supports LaTeX, the document markup language, which makes it easy to write

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equations seamlessly in the text. Many of you will not be familiar, so I will offer some tips to get your started. I encourage you to try it! The other option, which is also fine, is to upload pictures of written equations, or snapshots of equations prepared in equation editor in Word, for example.

*Tutorials address: Learning Outcomes 1-5*

## **Tutorial Homeworks**

These are not on Perusall. They are worksheets that follow on from the tutorials you have collaborated on. They are designed to build on the tutorials, and are to be completed on your own, though you can discuss problems that arise in the appropriate discussion threads.

*Tutorial homeworks address: Learning Outcomes 1-5*

## **Assessments**

One or two problems from the textbook will be assigned most weeks. These are to be submitted in two batches, at the mid-point of the semester and the end. They essentially function as a midterm and final, spread throughout the course.

*Assessments address: Learning Outcomes 1-5*

**When to complete assignments:** Quizzes and discussion posts are due at the end of each of the 12 weeks. Perusall assignments are due one week later. Your comments and annotations on reading assignments and tutorials are due at the end of the week they are assigned. These are not assigned uniformly – some weeks will have no reading assignments, and some no tutorials; some will have more than one reading. Tutorial homeworks are due at the end of each unit, in four batches, and the assessments are due at the ends of units 2 and 4. At the end of the syllabus you will find the precise dates for every single assignment of every type!

**Try to keep to these deadlines. However,** I know your lives are tremendously busy and there will be times when you are overwhelmed. I will always be flexible with due dates if you just give me a heads up when you need to be.

## **Grading**

We will use specifications-based grading in this course, in which, rather than assigning numerical scores to each assignment (which, although prevalent, are hard to standardize fairly), you simply receive a passing credit for completing an assignment to an acceptable standard, which will be specified with each assignment. Anyone who makes a good-faith attempt at all assignments will earn at least a B in the class. For each assignment you either pass or you do not.

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**Quizzes:** You pass a quiz by making more than 70%.

**Discussion posts:** A passing grade for a week's discussion forums requires making all required posts, and each post to be substantial in the sense that it contributes constructively to the conversation (which includes asking questions so long as they include context, justification, and details of what the poster has done to try and answer them).

**Perusall assignments (Reading and tutorials):** The system automatically calculates a percentage grade based on number and quality of annotations, interacting with each other, and time spent reading. I have set a threshold for passing.

**Tutorial Homeworks:** A good faith attempt has been made, that is, the student has completed all of it, gets the right answer more often than not, and thoroughly explains their thoughts and makes clear their working.

**Assessments:** The student scores more than 70% on the assessment.

If at any point you do not feel the grade fairly reflects your performance, please let me know.

Your final grade will be assigned based on the following scheme:

**You will get a A if you:**

Meet all the requirements of getting a B, but in addition:

- Pass 12 out of 12 tutorial homeworks
- Get an average of 90% or more on the two assessments.

**You will get a B if you:**

- Pass 10 out of 12 Perusall reading assignments
- Pass 10 out of 12 Perusall tutorial assignments
- Pass 10 out of 12 tutorial homeworks
- Pass 10 out of 12 quizzes
- Meet the requirements in 10 out of 12 discussion forums
- Get an average of 70% or more on both assessments.

**You will get a C if you:**

- Pass 8 out of 12 Perusall reading assignments
- Pass 8 out of 12 Perusall tutorial assignments
- Pass 8 out of 12 tutorial homeworks
- Pass 8 out of 12 quizzes
- Meet the requirements in 8 out of 12 discussion forums
- Get 70% or more on at least one assessment.

**You will get a D if you:**

- Pass 6 out of 12 Perusall reading assignments
- Pass 6 out of 12 Perusall tutorial assignments
- Pass 6 out of 12 tutorial homeworks
- Pass 6 out of 12 quizzes
- Meet the requirements in 6 out of 12 discussion forums

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- Get 60% or more on at least one assessment.

**You will get a F if you:**

- Do not meet the requirements for a D.

## **TECHNOLOGY REQUIREMENTS**

### **LMS**

All course sections offered by East Texas A&M University have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:

<https://community.brightspace.com/s/article/Brightspace-Platform-Requirements>

LMS Browser Support:

[https://documentation.brightspace.com/EN/brightspace/requirements/all/browser\\_support.htm](https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm)

Zoom Video Conferencing Tool

[https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom\\_Account.aspx?source=universalmenu](https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom_Account.aspx?source=universalmenu)

## **ACCESS AND NAVIGATION**

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or [helpdesk@tamuc.edu](mailto:helpdesk@tamuc.edu).

**Note:** Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, an ETAMU campus open computer lab, etc.

## **COMMUNICATION AND SUPPORT**

If you have any questions or are having difficulties with the course material, please contact your Instructor.

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## Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

## COURSE AND UNIVERSITY PROCEDURES/POLICIES

### Course Specific Procedures/Policies

#### Academic integrity

A major goal of this and most every university course is for you to learn and appreciate subject material. Academic dishonesty (“cheating”) actively prevents you from achieving this goal. Academic dishonesty is taken seriously by the University and by me, and **will not be tolerated.** (See the ETAMU Code of Student Conduct and ETAMU Procedures A 13.04, 13.12, 13.31, and 13.32.)

This conduct is not only considered wrong in this course and at this University, but also in the real world. Engaging in these activities will get you fired from a job and prevent you from getting another job.

Unethical student conduct includes:

- **Unauthorized use of generative AI.** Generative AI tools should not be used for any purpose in this class unless you are explicitly told to use them. It is generally a bad idea anyway, because the training sets that are used by generative AI are full of inaccurate scientific information. Generative AI is meant to produce text or images that simulate English speech, and they are quite good at this. They have little or no ability at fact checking.
- **Plagiarism**, or copying the words of others with the intent of making it look like your own. Whether you use someone else’s phrase word for word, or whether you try and change a few words, or even if you just borrow someone else’s original idea and don’t give them credit, that’s unethical. Use your own words whenever possible, give credit to wherever you got an idea, and put direct quotes inside quotation marks.
- **Cheating** involves trying to trick me or others into thinking you did work that you really didn’t do, or into thinking you know what you really don’t know. This can include stealing exams, changing your answers on a graded exam or assignment and claiming it was graded wrongly, putting your name on someone else’s homework, and so on.
- **Searching the Internet for homework solutions and entering answers you find.** Searching the Internet for help on a topic is okay. For example, suppose a question asks, “Describe the life cycle of a star that has the same mass as the sun.” Typing that phrase into Google and cutting and pasting the text in the answer box is considered cheating. Typing “star life cycles” into Google, reading

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a few web pages, and summarizing the information in your own words is not cheating.

- **Borrowing a previous student's homework, exams, or solution sets.** "Borrowing" includes looking at someone's submitted homework, screen shots, stealing returned homeworks, and so on.
- **Collusion** is working with another person to cheat. This can include copying someone else's answers to an exam or assignment, doing work for another student, buying or otherwise obtaining homework/exam solutions from any source online or off-line, or any other instance of multiple people engaging in some form of cheating or dishonesty. Working with other students on an assignment is fine as long as everyone contributes and each student does their own work.
- **Any other activity that, to a reasonable person, looks wrong.** If you have any doubt whatsoever whether a certain action is considered dishonest, please ask me *before* engaging in the activity. There is no need to be embarrassed about asking, and I won't penalize you for asking! In this class, if you follow the maxim "it's easier to beg forgiveness than to ask permission", don't expect forgiveness to be forthcoming.

***If you engage in academic dishonesty during any graded activity, you will receive no credit for that activity. More than one instance of dishonesty by a student will result in automatic failure of the course and referral of the student for disciplinary action.***

For further information, search the East Texas A&M website for "academic integrity policy".

D2L provides me with tools that check for common forms of online cheating and collusion. These include, but aren't limited to: time stamps, location stamps, and automated comparison of essay answers. I will use these tools.

### **Sexual Harassment and Violence**

Violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc.

If you or someone you know is a victim of harassment, stalking, domestic violence, sexual assault, or related crimes, has been harassed or assaulted, here are some resources for you:

### **24/7 Resources**

- National Domestic Awareness Hotline: 1-800-799-SAFE (7223)
- National Sexual Assault Hotline: 1-800-656-4673
- National Suicide Prevention Lifeline: 988

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## Campus Resources

- **Call 911 in emergency situations**
- If you or someone you know has been impacted and needs support, email: [VictimSupport@tamuc.edu](mailto:VictimSupport@tamuc.edu) (monitored Monday-Friday, 8am-5pm)
- Victim Advocacy and Support: <https://www.tamuc.edu/student-advocacy-support/victim-support-services/>
- How to Help and Report: <https://www.tamuc.edu/student-advocacy-support/victim-support-services/>
- How to Report Concerns About a Fellow Student: [https://cm.maxient.com/reportingform.php?TAMUCommerce&layout\\_id=20](https://cm.maxient.com/reportingform.php?TAMUCommerce&layout_id=20)
- University Title IX Compliance Office: <https://www.tamuc.edu/titleix/>
- University Title IX Contact: Amanda Berry, 903-886-5991, [titleix@tamuc.edu](mailto:titleix@tamuc.edu)
- University Police Department Sexual Assault pages: <https://www.tamuc.edu/university-police-department/crime-prevention/>
- University Counseling Center: <https://www.tamuc.edu/counseling-center/>
- Campus police email: [upd@tamuc.edu](mailto:upd@tamuc.edu)

## External resources:

Crisis center of Northeast Texas: <http://www.ccnex.org>

Know your IX: <http://knowyourix.org>

End rape on campus: <http://endrapeoncampus.org>

Clery Center for Security on Campus: <http://clerycenter.org>

Not Alone: <http://changingourcampus.org/about-us/not-alone/>

## University Specific Procedures

### Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the [Student Guidebook](http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx).  
<http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum:  
<https://www.britannica.com/topic/netiquette>

### ETAMU Attendance

For more information about the attendance policy please visit the [Attendance](#) webpage and [Procedures 13.99.99.R0.01](#):  
<http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf>

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## **Academic Integrity**

Students at East Texas A&M University are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

[Undergraduate Academic Dishonesty 13.99.99.R0.03 Undergraduate Student Academic Dishonesty Form](#)

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/documents/13.99.99.R0.03UndergraduateStudentAcademicDishonestyForm.pdf>

[Graduate Student Academic Dishonesty Form](#)

<http://www.tamuc.edu/academics/graduateschool/faculty/GraduateStudentAcademicDishonestyFormold.pdf>

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf>

## **Students with Disabilities-- ADA Statement**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

### **Office of Student Disability Resources and Services**

East Texas A&M University

Velma K. Waters Library Rm 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: [studentdisabilityservices@tamuc.edu](mailto:studentdisabilityservices@tamuc.edu)

Website: [Office of Student Disability Resources and Services](#)

<http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/>

## **Nondiscrimination Notice**

East Texas A&M University will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

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## **Campus Concealed Carry Statement**

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in East Texas A&M University buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and East Texas A&M Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#) document and/or consult your event organizer.

Web url:

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all East Texas A&M campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

## **East Texas A&M Supports Students' Mental Health**

The Counseling Center at East Texas A&M, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit [www.tamuc.edu/counsel](http://www.tamuc.edu/counsel)

## **AI use policy**

East Texas A&M University acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

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In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

13.99.99.R0.03 Undergraduate Academic Dishonesty

13.99.99.R0.10 Graduate Student Academic Dishonesty

## Course Outline / Calendar

### Schedule of Topics

Unit	Week	Date Unit Opens	Topic	Chapter / Sections
1. Basic Macroscopic Thermodynamics	1	Jan 14	Basic quantities and concepts – thermal equilibrium, heat, temperature, the ideal gas, the zeroeth law of thermodynamics	1.1-1.2
	2	Jan 24	The microphysics of the ideal gas, equipartition, work and internal energy, the first law of thermodynamics	1.3-1.4
	3	Jan 31	Thermal and transport properties of matter: heat capacity, conduction, viscosity, diffusion	1.5-1.7
2. Entropy and the statistical origin of thermodynamics	4	Feb 14	Microstates and macrostates	2.1-2.3
	5	Feb 21	Multiplicity	2.4-2.6
	6	Feb 28	Entropy and the microscopic meaning of temperature	3
3. Practical applications of thermodynamics	7	Mar 14	Macroscopic Entropy	4
	8	Mar 21	Heat Engines	5
	9	Mar 28	Chemical Thermodynamics	5
4. Statistical Mechanics	10	Apr 11	Phase Transitions	6
	11	Apr 18	Boltzmann statistics / the partition function	7/8

*The syllabus/schedule are subject to change.*

### Schedule of Specific Assignments

	READING	TUTORIAL	TUTORIAL HOMEWORK	ASSESSMENTS
WEEK 1	Péturrson 2003	Ideal Gas: Macro	Ideal Gas: Macro	Problems selected from Schroeder Chapters 1-2, plus the counting states simulation
WEEK 2	Kautz 2005 I	Ideal Gas: Micro First Law	Ideal Gas: Micro	
WEEK 3	Kautz 2005 II	Enthalpy	First Law and Enthalpy	
			TUTORIAL HW TURN-IN 1	
WEEK 4		Counting States	Counting States	
WEEK 5		The Einstein Solid		
WEEK 6	Styer 2000 Phillips 2015	Entropy and the Approach to Equilibrium		
			TUTORIAL HW TURN-IN 2	HOMEWORK TURN-IN
WEEK 7	Loverude 2015	Entropy	Entropy	Problems selected from Schroeder Chapters 3-7
WEEK 8		Thermodynamic Engines	Thermodynamic Engines	
WEEK 9	Cannon 2004 Prentis 2016	Thermodynamic Potentials		
			TUTORIAL HW TURN-IN 3	
WEEK 10	Glasser 2002 Glasser 2004	Phase Diagrams		
WEEK 11	Smith 2015 Battaglia 2009	Boltzmann Factor		
WEEK 12				
			TUTORIAL HW TURN-IN 4	HOMEWORK TURN-IN

*The syllabus/schedule are subject to change.*



### Course Due Dates: Discussion Posts

Each week you must post at least **one** post in each of **two different** discussion threads, giving your initial thoughts on the subject of the thread or any conceptual or mathematical difficulties you are having with the thread subject. You must also post at least **one** follow up posts in your choice of the **previous week's** threads, responding to another person's comments, or one of my comments. That makes a total of **three** posts per week that will be graded.

Discussion threads for a particular week open at **12:01 a.m.** each **Friday** with the rest of the week's material. To receive credit for your posts, they must be made within the time-frame outlined below. The threads remain open until the end of the semester.

Week	Discussion Threads Open	2 Posts in Different Threads Due	1 Follow-up Post Due
Introductions	Jan 14		
1	Jan 14	Jan 26	Feb 2
2	Jan 24	Jan 26	Feb 9
3	Jan 31	Feb 9	Feb 16
4	Feb 14	Feb 23	Mar 2
5	Feb 21	Mar 2	Mar 9
6	Feb 28	Mar 9	Mar 16
Spring Break March 10-14			
7	Mar 14	Mar 23	Mar 30
8	Mar 21	Mar 30	Apr 6
9	Mar 28	Apr 6	Apr 13
10	Apr 11	Apr 20	Apr 27
11	Apr 18	Apr 27	May 4
12	Apr 25	May 4	

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## Course Due Dates: Quizzes and Perusall Assignments

The introductory week's **syllabus quiz** becomes available on **Tuesday Jan 14th at 12:01 a.m.** *For the syllabus quiz only, you may take the quiz as many times as you like. You will only gain access to the first week of material once you have made 100% on the syllabus quiz and have completed.* Quizzes on each week's reading material become available at **12:01 a.m.** each **Friday** along with the rest of the week's material, and close at **11:59 p.m. (midnight)** the following **Sunday, 9 days later.**

**NOTE:** *Apart from the syllabus quiz, quizzes can only be attempted once. Once you begin taking the quiz, you will have a time limit of one hour to complete it. Once completed, you cannot return to it and revise your answers.*

Perusall assignments – tutorials and reading – are available the same day as the quiz, but are due one week after the quiz (so you have just over 2 weeks to complete the perusal assignments, except for the first ones for which you have just over 3 weeks). **NOTE:** Not all weeks have Reading or Tutorial Perusall assignments – see assignment schedule for specifics.

<b>Week</b>	<b>Quiz Available / Reading and Tutorial Annotation on Perusall Starts</b>	<b>Quiz Due</b>	<b>Reading and Tutorial Annotation On Perusall Ends</b>
	Jan 14 (Syllabus Quiz)	Access to course requires completion	
1	Jan 14	Jan 26	Feb 02
2	Jan 24	Feb 2	Feb 9
3	Jan 31	Feb 9	Feb 16
4	Feb 14	Feb 23	Mar 2
5	Feb 21	Mar 2	Mar 9
6	Feb 28	Mar 9	Mar 16
Spring Break Mar 10-14			
7	Mar 14	Mar 23	Mar 30
8	Mar 21	Mar 30	Apr 6
9	Mar 28	Apr 6	Apr 13
10	Apr 11	Apr 20	Apr 27
11	Apr 18	Apr 27	May 4
12	Apr 25	May 4	

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### Course Due Dates: Tutorial Homeworks / Assessments

When a new week has associated homework, it becomes available at the start of that week, on **Friday at 12:01 a.m.** They are due at **11:59 p.m.** on the due dates shown in the calendar below. I do make all the homeworks/assessments available in a separate module so you have the option of working ahead if time permits.

Week	HW Available	Tutorial HW Due		Assessments Due
1	Jan 14	Feb 18		Mar 16
2	Jan 24			
3	Jan 31			
4	Feb 14	Mar 16		
5	Feb 21			
6	Feb 28			
Spring Break Mar 10-14				
7	Mar 14	Apr 13		May 8
8	Mar 21			
9	Mar 28			
10	Apr 11	May 8		
11	Apr 18			
12	Apr 25			

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