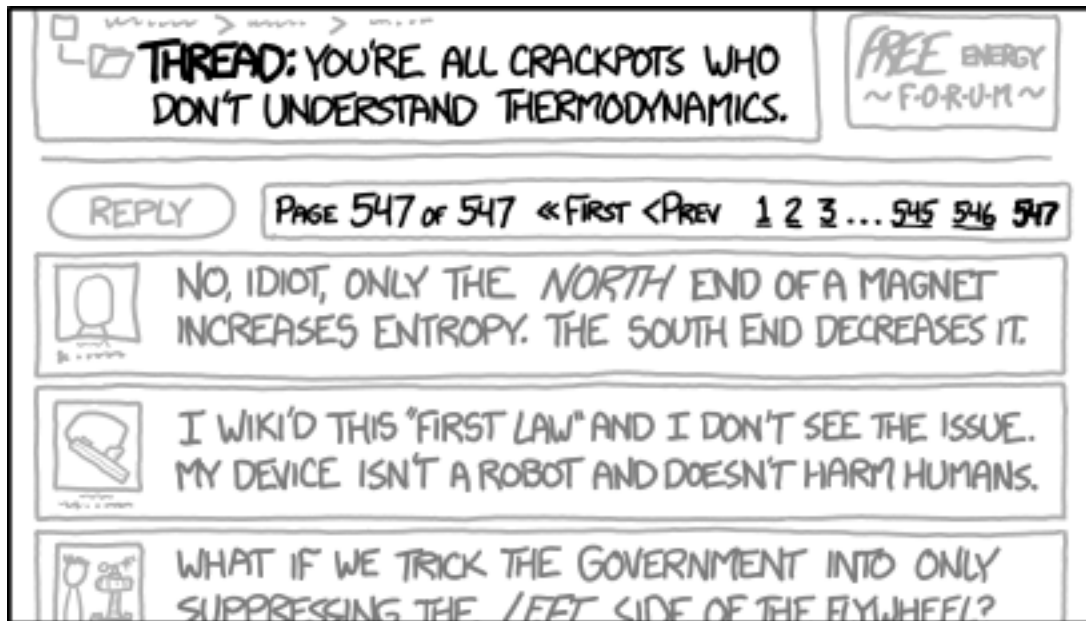




PHYS 535 01W – THERMODYNAMICS FOR EDUCATORS

ONLINE COURSE SYLLABUS: SPRING 2024



IRONICALLY, THE ARGUMENT I STARTED ON A PERPETUAL MOTION FORUM IN 2004 SHOWS NO SIGNS OF SLOWING DOWN.

<https://xkcd.com/1166/>

Instructor: Dr. William Newton, Associate Professor

Office Location: STC 236

Course Dates: Jan 10 – May 11

University Email Address: William.Newton@tamuc.edu

Course Time Zone: Central Time USA

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.

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 TAMUC university email addresses for email communication.*

COURSE INFORMATION

Materials – Textbooks, Readings, Supplementary Readings

The required book can be ordered from online retailers for generally less than \$100.

Textbooks Required

Schroeder, V. Daniel. (1999), *An Introduction to Thermal Physics*, Addison-Wesley, ISBN-10: 0201380277, ISBN-13: 978-0201380279

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, 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.
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. Your TAMUC 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 10th – Jan 28th, 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. Wednesday, January 10th** 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 graded, but it must be completed *with 100% correct answers* before moving 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).
- (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 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 what answers you got wrong.

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 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.

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
Get 60% or more on at least one assessment.

You will get a D if you:

Do not meet the requirements for a D.

TECHNOLOGY REQUIREMENTS

Browser support

D2L is committed to performing key application testing when new browser versions are released. New and updated functionality is also tested against the latest version of supported browsers. However, due to the frequency of some browser releases, D2L cannot guarantee that each browser version will perform as expected. If you encounter any issues with any of the browser versions listed in the tables below, contact D2L Support, who will determine the best course of action for resolution. Reported issues are prioritized by supported browsers and then maintenance browsers.

Supported browsers are the latest or most recent browser versions that are tested against new versions of D2L products. Customers can report problems and receive support for issues. For an optimal experience, D2L recommends using supported browsers with D2L products.

Maintenance browsers are older browser versions that are not tested extensively against new versions of D2L products. Customers can still report

problems and receive support for critical issues; however, D2L does not guarantee all issues will be addressed. A maintenance browser becomes officially unsupported after one year.

Note the following:

- Ensure that your browser has JavaScript and Cookies enabled.
- For desktop systems, you must have Adobe Flash Player 10.1 or greater.
- The Brightspace Support features are now optimized for production environments when using the Google Chrome browser, Apple Safari browser, Microsoft Edge browser, Microsoft Internet Explorer browser, and Mozilla Firefox browsers.

Desktop Support

Browser	Supported Browser Version(s)	Maintenance Browser Version(s)
Microsoft® Edge	Latest	N/A
Microsoft® Internet Explorer®	N/A	11
Mozilla® Firefox®	Latest, ESR	N/A
Google® Chrome™	Latest	N/A
Apple® Safari®	Latest	N/A

Tablet and Mobile Support

Device	Operating System	Browser	Supported Browser Version(s)
Android™	Android 4.4+	Chrome	Latest
Apple	iOS®	Safari, Chrome	The current major version of iOS (the latest minor or point release of that major version) and the previous major version of iOS (the latest minor or point release of that major version). For example, as of June 7, 2017, D2L supports iOS 10.3.2 and iOS 9.3.5, but not iOS 10.2.1, 9.0.2, or any other version. Chrome: Latest version for the iOS browser.

Device	Operating System	Browser	Supported Browser Version(s)
Windows	Windows 10	Edge, Chrome, Firefox	Latest of all browsers, and Firefox ESR.

- You will need regular access to a computer with a broadband Internet connection. The minimum computer requirements are:
 - 512 MB of RAM, 1 GB or more preferred
 - Broadband connection required courses are heavily video intensive
 - Video display capable of high-color 16-bit display 1024 x 768 or higher resolution
- You must have a:
 - Sound card, which is usually integrated into your desktop or laptop computer
 - Speakers or headphones.
 - *For courses utilizing video-conferencing tools and/or an online proctoring solution, a webcam and microphone are required.
- Both versions of Java (32 bit and 64 bit) must be installed and up to date on your machine. At a minimum Java 7, update 51, is required to support the learning management system. The most current version of Java can be downloaded at: [JAVA web site http://www.java.com/en/download/manual.jsp](http://www.java.com/en/download/manual.jsp)
- Current anti-virus software must be installed and kept up to date.

Running the browser check will ensure your internet browser is supported.

Pop-ups are allowed.
JavaScript is enabled.
Cookies are enabled.

- You will need some additional free software (plug-ins) for enhanced web browsing. Ensure that you download the free versions of the following software:
 - [Adobe Reader https://get.adobe.com/reader/](https://get.adobe.com/reader/)
 - [Adobe Flash Player \(version 17 or later\) https://get.adobe.com/flashplayer/](https://get.adobe.com/flashplayer/)
 - [Adobe Shockwave Player https://get.adobe.com/shockwave/](https://get.adobe.com/shockwave/)
 - [Apple Quick Time http://www.apple.com/quicktime/download/](http://www.apple.com/quicktime/download/)
- At a minimum, you must have Microsoft Office 2013, 2010, 2007 or Open Office. Microsoft Office is the standard office productivity software utilized by faculty, students, and staff. Microsoft Word is the standard word processing software, Microsoft Excel is the standard spreadsheet software, and Microsoft PowerPoint is the standard presentation software. Copying and pasting, along with attaching/uploading documents for assignment submission, will also be required. If you do not have Microsoft Office, you can check with the bookstore to see if they have any student copies.

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.

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, a TAMUC campus open computer lab, etc.

COMMUNICATION AND SUPPORT

Brightspace Support

Student Support

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

Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778 or click on the **Live Chat** or click on the words "[click here](#)" to submit an issue via email.



System Maintenance

D2L runs monthly updates during the last week of the month, usually on Wednesday. The system should remain up during this time unless otherwise specified in an announcement. You may experience minimal impacts to performance and/or look and feel of the environment.

We will use Zoom for the live office hours; I will email a link ahead of each office hours. Note: It is not required that you attend live office hours.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures

Academic Honesty

Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including (but not limited to) receiving a failing grade on the assignment, the possibility of failure in the course and dismissal from the University. Since dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. In **ALL** instances, incidents of academic dishonesty will be reported to the Department Head. Please be aware academic dishonesty includes (but is not limited to) cheating, plagiarism, and collusion.

Cheating is defined as:

- Copying another's test or assignment.
- Communication with another during an exam or assignment (i.e. written, oral or otherwise).
- Giving or seeking aid from another when not permitted by the instructor.
- Possessing or using unauthorized materials during the test.
- Buying, using, stealing, transporting, or soliciting a test, draft of a test, or answer key.

Plagiarism is defined as:

- Using someone else's work in your assignment without appropriate acknowledgement.
- Making slight variations in the language and then failing to give credit to the source.

Collusion is defined as:

- Collaborating with another, without authorization, when preparing an assignment.

If you have any questions regarding academic dishonesty, ask. Otherwise, I will assume that you have full knowledge of the academic dishonesty policy and agree to the conditions as set forth in this syllabus. **Homework and discussion posts will be randomly tested for plagiarism.**

Attendance Policy

In an online class, attendance means active participation; students are expected to spend at least 2 hours/week on the discussion threads and at

least 10 hours/week is required to complete all the assignments, including reading. If you are unable to log on for an extended period of time (greater than a week) then contact me *in advance* to discuss how to proceed. We recognize that many of you already have a busy work schedule, and that occasionally you might get behind in a unit. Spending even 15-30 minutes a day on class material and the discussion threads will help greatly, ***and if you find yourself struggling at any time, please do not hesitate emailing me; I can be flexible to accommodate your busy schedule.***

Assignment policy

Students will be responsible for knowing when due dates for assignments are by reading the syllabus, looking at the schedules under "Course Home" and in this syllabus, and reading the relevant sections when posted on MyleoOnline.

Netiquette: Communication Courtesy Code

Students are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. The same rules apply online as they do in person. Be respectful of other students. Foul discourse will not be tolerated. Please take a moment and read the following links concerning "netiquette". <http://www.albion.com/netiquette/>
<http://www2.nau.edu/d-elearn/support/tutorials/discrubrics/netiquette.php>

UNIVERSITY SPECIFIC PROCEDURES

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>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: [Netiquette](#)
<http://www.albion.com/netiquette/corerules.html>

TAMUC Attendance

For more information about the attendance policy please visit the [Attendance](#) webpage and [Procedure 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>

Academic Integrity

Students at Texas A&M University-Commerce 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](#)

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

[Graduate Student Academic Dishonesty 13.99.99.R0.10](#)

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10GraduateStudentAcademicDishonesty.pdf>

A&M-Commerce Supports Students' Mental Health

The Counseling Center at A&M-Commerce, 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

ADA Statement

Students with Disabilities

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

Texas A&M University-Commerce

Geer Library- Room 162

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

Fax (903) 468-8148

Email: studentdisabilityservices@tamuc.edu

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

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

Nondiscrimination Notice

Texas A&M University-Commerce 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.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce 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 A&M-Commerce 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 A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

AI use policy

Texas A&M University-Commerce 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.

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

This schedule is tentative.

Unit	Week	Date week opens	Topic	Chapter/Sections
1. Basic Macroscopic Thermodynamics	1	Jan 14	Basic quantities and concepts – thermal equilibrium, heat, temperature, the ideal gas, the zeroth law of thermodynamics.	1.1-1.2
	2	Jan 25	The microphysics of the ideal gas, equipartition, work and internal energy, the first law of thermodynamics	1.3-1.4
	3	Feb 1	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 8	Microstates and macrostates	2.1-2.3
	5	Feb 15	Multiplicity	2.4-2.6
	6	Feb 22	Entropy and the microscopic meaning of temperature	3
3. Practical applications of thermodynamics	7	Mar 8	Macroscopic Entropy	4
	8	Mar 15	Heat Engines	5
	9	Mar 29	Chemical Thermodynamics	5
4. Statistical Mechanics	10	Apr 12	Phase Transitions	6
	11	Apr 19	Boltzmann statistics/The partition function	7/8
	12	Apr 26	Quantum statistics	7/8

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

+ WEEKLY QUIZZES AND DISCUSSION POSTS

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 10		
1	Jan 12	Jan 28	Feb 4
2	Jan 26	Feb 4	Feb 11
3	Feb 2	Feb 11	Feb 18
4	Feb 16	Feb 25	Mar 3
5	Feb 23	Mar 3	Mar 10
6	Mar 1	Mar 10	Mar 17
Sprint Break March 14-18			
7	Mar 15	Mar 24	Mar 31
8	Mar 22	Mar 31	Apr 7
9	Mar 29	Apr 7	Apr 14
10	Apr 12	Apr 21	Apr 28
11	Apr 19	Apr 28	May 5
12	Apr 26	May 5	

COURSE DUE DATES: QUIZZES AND PERUSALL ASSIGNMENTS

The introductory week's **syllabus quiz** becomes available on **Wednesday Jan 12th** 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.

WEEK	QUIZ AVAILABLE/READING AND TUTORIAL ANNOTATION ON PERUSALL STARTS	QUIZ DUE	READING AND TUTORIAL ANNOTATION ON PERUSALL ENDS
	Jan 10 (Syllabus Quiz)	Access to course requires completion	
1	Jan 12	Jan 28	Feb 04
2	Jan 26	Feb 04	Feb 11
3	Feb 2	Feb 11	Feb 18
4	Feb 16	Feb 25	Mar 3
5	Feb 23	Mar 3	Mar 10
6	Mar 1	Mar 10	Mar 17
Spring Break March 11-15			
7	Mar 15	Mar 24	Mar 31
8	Mar 22	Mar 31	Apr 7
9	Mar 29	Apr 7	Apr 14
10	Apr 12	Apr 21	Apr 28
11	Apr 19	Apr 28	May 5
12	Apr 26	May 5	

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 **11:59pm** 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 12	Feb 18	
2	Jan 26		
3	Feb 2		
/			
4	Feb 16	Mar 17	Mar 17
5	Feb 23		
6	Mar 1		
Spring Break March 11-15			
7	Mar 15	Apr 14	
8	Mar 22		
9	Mar 29		
/			
10	Apr 12	May 9	May 9
11	Apr 19		
12	Apr 26		