

Physics 265 Thermal Physics (3-credit) (Tentative)
Spring Semester - 2022

Mode of Instruction: In-person
Classroom: LAFAYETTE HALL L210
Time: MWF 3:30 p.m. – 04:20 p.m.

Instructor: Dr. Varuni Seneviratne
Office: INNOV E237
Email: vsenevir@uvm.edu

Office Hours and Availability: To be announced

When you need help at other times, email me and I will get back to you as early as I can.

COURSE DESCRIPTION:

Topics covered include Thermodynamics, kinetic theory, and statistical mechanics. The prerequisites are Physics 152 (Fundamentals of Physics II) or Physics 125 (Physics for Engineers II), and Math 121 (Calculus III).

COURSE OBJECTIVES:

Overall

Fundamental concepts of thermodynamics, kinetic theory and statistical mechanics are studied in this course. Students will learn the concepts and mathematical formulations of above topics and will develop strategies to analyze problems. Classical Statistical mechanics and quantum statistics will be introduced. Bose and Fermi gases will be discussed.

knowledge of these fundamental principle

TEXTBOOK (required):

Textbook: *Thermal Physics*, 2nd edition, by Kroemer and Kittel Published by W. H. Freeman and Com. NY.

OTHER USEFUL REFERENCE BOOKS:

Mathematics of Choice: How to count without counting, I. Niven.

Fundamentals of Statistical and Thermal Physics, F. Reif.

Thermodynamics and Statistical Mechanics, Greiner, W., Neise, L., Stöcker, H.

PEDAGOGY

You will be led through a review of reading and readiness assignments, and several example problems in most lecture periods, with opportunities to pause, reflect, and comment on what you've learned. You will work in small groups during class and actively participate in your learning. You are expected to actively participate in class discussions, individual and group activities, throughout the semester. Various contemplative activities will be infused into your learning activities.

Classroom Environment Expectations:

In this class, we will work together to develop a learning community that is inclusive and respectful. As a learning community we will seek to encourage and appreciate expressions of different ideas, opinions, and beliefs in the spirit of Our Common Ground. Meaningful and constructive dialogue is encouraged in this class. This requires mutual respect, willingness to listen, and open-mindedness to opposing points of view. Respect for individual differences and alternative viewpoints will be maintained at all times in this class. Conduct that substantially or repeatedly disrupts the ability of faculty and instructors to teach and the ability of students to engage may result in my asking a student to temporarily leave the classroom. [See Undergraduate Catalogue - Classroom Code of Conduct \(p. 443-444\).](#)

UVM expects students, faculty, and staff to remain compliant with all COVID-19 recommendations and measures in place for UVM, the State of Vermont, and the City of Burlington.

Inclusive Learning Environment

Our intention is for CEMS to be a place where you will be treated with respect and kindness. We welcome individuals of all ages, backgrounds, beliefs, interests, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of the College are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the community. If you ever feel that you have been unfairly treated or judged by an instructor, a mentor, another student, or another member of the CEMS community, please let someone know. Your instructors and advisors in the [CEMS Office of Student Services](#) are available to discuss any concerns or you can report an incident of bias through the [Campus Bias Response Program](#).

Attendance and Illness:

You are expected to attend all regularly scheduled classes. With the exceptions outlined in the [Attendance Policy](#), the instructor has the final authority to excuse absences. Please note that class attendance and participation count 10% towards the overall course grade through quizzes.

If a student will not be able to attend in-person classes for qualifying health reasons, Student Health Services (SHS) will send a notification to the [CEMS Office of Student Services](#) informing them of this along with the dates the student is unable to attend. The SHS notification will specify whether the request for flexibility is only around in-person class attendance or includes additional flexibility for assignments and tests because the student is too ill to participate. Students are responsible for working with the instructor to make up class content and work you miss due to a documented illness.

GRADING:

Homework (about 10-12)	40%
Reading Quizzes/pop quizzes	10%
Midterm Exams (1)	20%
Final Exam	30%

Total	100%

The grading scale will be provided on the first day of classes.
A statistical scale will be used at instructor’s judgment.

EXAM AND HOMEWORK POLICIES:

Midterm Exams are scheduled as follows:

In-class Midterm Exam 1: Week before the spring break

In-class Final Exam:

All exams will be timed, delivered in class and will be proctored. Make-up exams will be given at the discretion of the instructor. An appropriate, valid documentation of absence will be required for consideration of a make-up exam. It is strongly encouraged to obtain prior permission from the instructor. Examples of valid reasons are; injury or illness that is too severe or contagious for the student to attend, participation in a university authorized activity, death or major illness in a student's immediate family, time conflicts with other courses, or important travel plans (made before the first day of class – January 17th 2023). Additional instructions will be posted on Bb at least three days prior to the exam date.

Homework assignments will be assigned on the Bb. Homework assignments must be submitted **electronically as a single PDF file** (unless noted otherwise) using the correct Bb assignment link before they are due.

Email submissions will not be accepted.

No late assignments will be accepted and there will be no make-up quizzes and no make-up "in-class" questions and activities. Please note that the one lowest quiz grade and the lowest HW grade will be dropped.

COURSE OUTLINE: SEMESTER SCHEDULE (SUBJECT TO CHANGE)

Week	Topics/Activities (order may slightly change)	Assignments Due (To be announced)
1	States of Model Systems	
2	Temperature and Entropy	
3	Boltzmann Distribution and Helmholtz free Energy	
4	Thermal radiation and Plank Distribution	
5	Thermal radiation and Plank Distribution	
6	Chemical Potential and Gibbs Distribution	
7	Chemical Potential and Gibbs Distribution	
8		
9	Ideal Gas/Kinetic theory	

Week	Topics/Activities (order may slightly change)	Assignments Due (To be announced)
10	Fermi and Bose gases	
11	Fermi and Bose gases	
12	Heat and Work	
13	Semiconductor Statistics	
14	Phase Transformations/Binary Mixtures	
15	Chapter 20/Review	
		Final Exam (Cumulative)

REQUIRED SOFTWARE AND PLATFORMS:

Please read this technology check list to make sure you are ready for classes.

<https://www.uvm.edu/it/kb/student-technology-resources/>

You should contact the Helpline (802-656-2604) for support with technical issues.

The UVM Knowledge Base has many helpful articles and how-to guides on the various teaching and learning platforms supported at UVM: <https://www.uvm.edu/it/kb/>

This course uses resources in different formats. Please make sure that you can open a PDF document and watch a YouTube video. Adobe Acrobat Reader is needed to view PDF documents. If you do not have adobe reader on your computer you can download it for free from the Adobe website at <http://www.adobe.com>.

Blackboard (Bb):

Make sure you are using a supported browser to access Blackboard (Bb). To check your browser and for more help on using Bb, [please follow this link](#). Additionally, bookmark UVM Tech Team [Knowledge Base](#) to get UVM-specific information, and to get one-on-one help, if needed.

Bb will be used to (a) organize all course materials, (b) deliver and collect homework assignments and exams, (2) post grades, and (3) post weekly announcements.

Netiquette

Netiquette stands for Network Etiquette. It refers to proper behavior while interacting online. The golden rule of netiquette is essentially to treat people as you would want to be treated. Please be polite and considerate. Think about whether your comment could cause hurt feelings. Be careful about how your words can come across because misunderstandings can be common online.

Lived Name and Pronoun Information

The UVM Directory includes fields for indicating your lived name and your pronouns. Lived names (preferred names, names in use) are names that an individual wants to be known by in the University community. Entering your pronouns is strongly encouraged to help create a more inclusive and respectful campus community. To update your information, login to the UVM Directory. A preview box will allow

you to see how this information will appear in other systems used on campus such as Microsoft Teams and Blackboard.

More information about how to make changes to your lived name and pronouns is available in the [Knowledge Base](#).

To read more about official UVM policies, events, and initiatives regarding diversity, equity, and inclusion: <https://www.uvm.edu/diversity>

Academic Integrity

Offences against the **Code of Academic Integrity** are deemed serious and insult the integrity of the entire academic community. This policy addresses plagiarism, fabrication, collusion, and cheating. <https://www.uvm.edu/sites/default/files/UVM-Policies/policies/acadintegrity.pdf> (PDF link). Any suspected violations of the code are taken very seriously and will be forwarded to the [Center for Student Conduct](#) for further intervention.

Code of Student Conduct:

[UVM's Code of Student Conduct](#) outlines conduct expectations as well as students' rights and responsibilities.

Course Evaluation:

All students are expected to complete a mid-term evaluation and final evaluation of each course they are enrolled in. Course evaluations are anonymous and confidential. The information gained through the course evaluation, including constructive criticisms of the instructor, will be used to improve future versions of the course. You can access Blue course evaluation via Blackboard Homepage, myUVM or by visiting <https://blue.uvm.edu/uvm>. More instructions can be found in [this Knowledge Base article](#).

General statement regarding potential changes during the semester:

<http://catalogue.uvm.edu/>

The University of Vermont reserves the right to make changes in the course offerings, mode of delivery, degree requirements, charges, regulations, and procedures contained herein as educational, financial, and health, safety, and welfare considerations require, or as necessary to be compliant with governmental, accreditation, or public health directives.

Intellectual Property Statement/Prohibition on Sharing Academic Materials:

Students are prohibited from publicly sharing or selling academic materials that they did not author (for example: class syllabus, outlines or class presentations authored by the professor, practice questions, text from the textbook or other copyrighted class materials, etc.); and students are prohibited from sharing assessments (for example homework or a take-home examination). Violations will be handled under UVM's Intellectual Property policy and Code of Academic Integrity. Please note that 'sharing assessments' may also include course materials that students share on study sites such as Chegg and Course Hero.

Student Learning Accommodations:

In keeping with University policy, any student with a documented disability interested in utilizing ADA accommodations should contact Student Accessibility Services (SAS), the office of Disability Services on campus for students. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly recommended to discuss with their faculty the accommodations they plan to use in each course. Faculty who receive Letters of Accommodation with [Disability Related Flexible accommodations](#) will need to fill out the Disability Related Flexibility Agreement. Any questions from faculty or students on the agreement should be directed to the SAS specialist who is indicated on the letter.

Contact Student Accessibility Services (SAS):

A170 Living/Learning Center

[802-656-7753](tel:802-656-7753) (phone link)

access@uvm.edu (email link)

https://www.uvm.edu/academicsuccess/student_accessibility_services

Health and Wellbeing

The Center for Health & Wellbeing (CHWB) offers a wide range of services to support your mind, body, and soul while you're at UVM. The Student Health Services staff of board certified physicians, physician assistants, nurse practitioners, nurses, and dietitians work with patients and collaborate with other CHWB providers to ensure personalized and timely care to UVM students. Counseling & Psychiatry Services (CAPS) offers short-term individual counseling, urgent needs counseling, group counseling, outreach and education, psychiatry, referrals, and consultation services.

Please visit their website at: <http://www.uvm.edu/~chwb/> to find out more.

At Living Well they believe that mental and physical health go hand in hand. They have a variety of programs that offer you the space to create a wellness practice that will support your goals and positive intentions. I highly recommend you to visit their LivingWell website at

<http://www.uvm.edu/~chwb/livingwell/> and checkout the meditation and yoga videos.

Extensive research has shown the benefits of meditation towards the learning process.

http://www.huffingtonpost.com/2013/04/08/mindfulness-meditation-benefits-health_n_3016045.html

Counseling & Psychiatry Services (CAPS)

Phone: (802) 656-3340

C.A.R.E. If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at

<https://www.uvm.edu/studentaffairs>

Food Insecurity: The UVM Center for Health & Wellbeing provides several on- and off-campus resources for students struggling with food insecurity: <https://www.uvm.edu/health/food-insecurity-uvm>

Tips for Success:**Religious Holiday Policy Statement**

Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time. The complete policy is [here](#).

Grading:

Your grades will be posted on Bb. Please check your grades frequently and notify me if you find any mistakes. [This link](#) offers information on grading and GPA calculation.

Grade Appeals:

If you would like to contest a grade, please follow the procedures [outlined in this policy](#).

FERPA Rights Disclosure:

The purpose of UVM's [FERPA Rights Disclosure](#) is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and Privacy Act (FERPA) of 1974.

Final exam policy:

The University [final exam policy](#) outlines expectations during final exams and explains timing and process of examination period.

Statement on Alcohol and Cannabis in the Academic Environment

As a faculty member, I want you to get the most you can out of this course. You play a crucial role in your education and in your readiness to learn and fully engage with the course material. It is important to note that alcohol and cannabis have no place in an academic environment. They can seriously impair your ability to learn and retain information not only in the moment you may be using, but up to 48 hours or more afterwards. In addition, alcohol and cannabis can:

- Cause issues with attention, memory and concentration
- Negatively impact the quality of how information is processed and ultimately stored
- Affect sleep patterns, which interferes with long-term memory formation.
- It is my expectation that you will do everything you can to optimize your learning and to fully participate in this course.