

Physics 365 – Statistical Mechanics – Fall 2021

Instructors:

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Office hours: TR 3:00 pm – 4:00 pm (in person or MS Teams)

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Office hours: TBA

Schedule:

Lectures: TR 1:15 – 2:30 pm, Physics Theory Suite (Innovation E200)
Take-home Midterm exam: Start on 10/14/21 and due on 10/22/21
Take-home Final exam: Start on 12/09/21 and due on 12/16/21

Prerequisites:

Phys 265 – Thermal and Statistical Physics (or equivalent) and Math 121 (Vector Calculus)

Course Materials:

Statistical Mechanics, 3rd edition (2011, Elsevier).
Authors: R. K. Pathria and Paul D. Beale.
ISBN: 978-0-12-382188-1

Statistical Mechanics: Theory and Molecular Simulation, (2010, Oxford).
Authors: Mark E. Tuckerman.
ISBN: 978-0-19-852526-4

Thermal Physics, 2nd edition (1980, Macmillan).
Authors: Charles Kittel and Herbert Kroemer.
ISBN: 978-0-7167-1088-2

Grading:

The grade for the class will be computed based on weekly homework assignments (40 %), a midterm exam (25 %), a final exam (25 %), and in-class attendance/participation (10 %).

Homework:

Homework assignments will be assigned every Thursday and will be due the following Thursday at the beginning of lecture. Students are encouraged to work together, but you must write and turn in your own homework. Academic dishonesty will not be tolerated! No late assignments will be accepted.

Course plan (order and specific topics may change):

- Review of basic statistical mechanics and thermodynamics concepts including entropy, micro/macro-states, equilibrium, temperature, chemical potential, heat capacity, etc.
- Ensemble theory, phase space, Liouville's equation and the microcanonical ensemble
- Canonical ensemble, energy fluctuations, equipartition and virial theorems, examples
- Grand-canonical ensemble, correspondence with other ensembles
- Monte-Carlo and molecular dynamics simulation methods
- Thermostats, barostats, and the isobaric-isothermal ensemble
- Free-energy methods, time-dependent properties and correlation functions
- Quantum Statistics. Ideal Bose and Fermi Gases.
- Phase Transitions. Criticality, Universality and Scaling. Critical Exponents.
- Renormalization Group Approach to Phase Transitions.

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 SAS:

A170 Living/Learning Center;

802-656-7753

access@uvm.edu

www.uvm.edu/access

Student Responsibilities and Rights – Academic Integrity

Students are strongly encouraged to work together on problems during in-class activities and outside of class. However, each student must submit their own independent work unless specifically asked to submit a group answer. Submitting

somebody else's work as your own will be considered academic dishonesty and will be reported to the Center for Student Conduct.

The following policy addresses plagiarism, fabrication, collusion, and cheating:

<http://www.uvm.edu/policies/student/acadintegrity.pdf>

Grading Appeals:

<http://www.uvm.edu/policies/student/gradeappeals.pdf>

Religious Holidays

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.

<https://www.uvm.edu/registrar/religious-holidays>

FERPA Rights Disclosure

The purpose of this policy 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.

<http://catalogue.uvm.edu/undergraduate/academicinfo/ferparightsdisclosure/>

Promoting Health & Safety

The University of Vermont's number one priority is to support a healthy and safe community

Center for Health and Wellbeing

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

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>