P3400 Thermal Physics Winter 2025
Instructor: Ivan Saika-Voivod, office: C3026, phone: 864-8886, email: saika@mun.ca
Course homepage: see Brightspace course shell.

Classes: Mondays, Tuesdays and Thursdays 1:00 – 1:50 pm, Room C2045
Text: An Introduction to Thermal Physics, by Daniel V. Schroeder (2000)
Office Hours: To be determined given student preferences

Thermal Physics covers central concepts in thermodynamics and statistical mechanics, including temperature, entropy, the laws of thermodynamics, the Einstein model of solids, paramagnetism, Helmholtz and Gibbs free energies, chemical potential, thermodynamic identities, Boltzmann statistics, the partition function, and quantum statistics.
PR: Mathematics 2000, PHYS 2053 and PHYS 2750 or (2056)

Course outline: We will cover chapters 1, 2, 3, 5, 6 and 7 of the text, which include [approximate number of lectures]

Chapter 1: Energy in Thermal Physics [5]
thermal equilibrium, the ideal gas, equipartition of energy, heat and work, compression work, heat capacities, rates of processes
Chapter 2: The Second Law [4]
two-state systems, the Einstein model of a solid, interacting systems, large systems, the ideal gas, entropy
Chapter 3: Interactions and Implications [4]
temperature, entropy and heat, paramagnetism, mechanical equilibrium and pressure, diffusive equilibrium and chemical potential
Chapter 5: Free Energy and Chemical Thermodynamics [6]
free energy as available work, free energy as a force toward equilibrium, phase transformations of pure substances, phase transformations of mixtures, (time permitting: dilute solutions, chemical equilibrium)
Chapter 6: Boltzmann Statistics [5]
the Boltzmann factor, average values, the equipartition theorem, the Maxwell speed distribution, partition functions and free energy, partition function for composite systems, ideal gas law
Chapter 7: Quantum Statistics [8]
the Gibbs factor, bosons and fermions, degenerate Fermi gases, blackbody radiation, Debye theory of solids, Bose-Einstein condensation

Evaluation:

Assignments (given daily)	20%
Midterm I	15% (Thursday, February 6, in class)
Midterm II	15% (Thursday, March 20, in class)
Final exam	50%

Communication and Course Continuity
In the case of a class disruptions, cancellations, or method of delivery change due to public health directives, and in the case of revisions to evaluation methods, the instructor or the Head of the department will notify all students registered in the course via the course shell in Brightspace. Any necessary revisions to the evaluation methods will be made in consultation with the students registered in this course. If a student demonstrates that they would be disadvantaged by the change, then, as per Section 6.7.4 of the University Calendar, accommodations will be made.

Wellness and Student Support:
Your wellbeing is important! There are many resources to support student wellness:
Student Life *http://www.mun.ca/student/*
Academic Support *http://www.mun.ca/currentstudents/academic/*
Student Support *http://www.mun.ca/currentstudents/student/*
Wellness and Counselling *http://www.mun.ca/currentstudents/wellness/*

Accommodations:
Any student requiring physical or academic accommodations or those with other special needs are encouraged to talk to the instructor as soon as possible. All conversations will remain confidential. The Blundon Centre offers an extensive array of services and has developed a comprehensive policy. See *http://www.mun.ca/blundon*.

Important general information from the University.

- **Missed Work:** Students who cannot complete assignments or midterm tests need to speak to the instructor and consult the University Calendar, University Regulations, Section 6.7.5: Exemptions from Parts of the Evaluation: *http://www.mun.ca/regoff/calendar/sectionNo=REGS-0601#REGS-1949*
- **Student Code of Conduct.** *https://www.mun.ca/student/student-supports-and-services/respectful-campus-community/student-code-of-conduct/*
- **Information Required for Medical Certificates:** *https://www.mun.ca/university-calendar/university-regulations-undergraduate/6/16/#REGS-0888*
- **Exemptions From Final Examinations** *http://www.mun.ca/regoff/calendar/sectionNo=REGS-0628*
- **Academic Misconduct** *http://www.mun.ca/regoff/calendar/sectionNo=REGS-0748*
- **Accommodations for Students with Disabilities (***https://www.mun.ca/student/about-us/units-and-contacts/accessibility-services---the-blundon-centre/***).**
- **Last day to drop a course** without academic prejudice is Tuesday March 4. See University Diary (*https://www.mun.ca/university-calendar/general-information/4/*).
- **Winter Break** is Feb. 24 to 28; **Lectures end** Wednesday April 9; **Exam period:** Sat. April 12 to Tues. April 22

Confidentiality: The University respects the confidentiality of all material contained in medical notes. Physicians are strongly advised to retain a copy of the medical note in case the medical note needs to be verified or reissued at a later date.

Use of Recording Devices in Classrooms
The lectures and displays (and all material) delivered or provided in this course, including any visual or audio recording thereof, are subject to copyright owned by the instructor. It is prohibited to record or copy by any electronic means, in any format, openly or surreptitiously, in whole or in part, in the absence of express written permission from the instructor any of the lectures or materials provided or published in any form during or from the course.

Assistive tools, such as generative AI
Original work, completed wholly by you, is expected to be submitted in this course. The use of an artificial intelligence tool like ChatGPT is not permitted.