Course Description
The physical principles underlying chemical systems and reactivity are explored, with an emphasis on the forces between molecules and the properties of matter. Principles of thermodynamics are presented, including thermochemistry, entropy and free-energy relationships. Applications include phase equilibria, chemical equilibria, solutions, colligative properties, and electrochemistry.

Course Prerequisites
CHEM 1011.03/CHEM 1012.03 (or equivalent) and a grade of C- or better in MATH 1000.03 (or equivalent). PHYC 1280.03/PHYC 1290.03 or PHYC 1300.06 is strongly recommended.

Learning Objectives
Upon successful completion of this course, students will have the ability to explain and solve problems relating to:
- phase diagrams and phase changes,
- heat, work, and conservation of energy,
- derivation and prediction thermodynamic quantities, and
- entropy, free energy, and conditions for spontaneity of chemical processes.

Course Materials
There is no required textbook. “Physical Chemistry”, 11th ed. by Peter Atkins, Julio de Paula, and James Keeler, is the recommended textbook for this course. Copies can be purchased online.

Course Assessment
<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td>20%</td>
</tr>
<tr>
<td>Assignments</td>
<td>15%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>45%</td>
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</tbody>
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Effective September 1, 2014, the Department of Chemistry policy is that for all Chemistry courses beyond first year, a minimum grade of 50% on the written test/final exam component (which includes both the midterm and final examinations) is required in order to pass the course. In addition, students
must complete all of the experiments in the laboratory portion of the course.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale:

- A+ (90-100)
- B+ (77-79)
- C+ (65-69)
- D (50-54)
- A (85-89)
- B (73-76)
- C (60-64)
- F (<50)
- A- (80-84)
- B- (70-72)
- C- (55-59)

Note that Nov 1, 2021 is the last day to drop fall term classes with a “W”.

Course Policies on Missed or Late Academic Requirements
Assignments are to be completed independently. Late assignments will not be accepted and will be assigned a mark of zero. If you are unable to come to class to hand in an assignment (for example, because of illness, a missed bus, etc.), you may email me the assignment any time up to the start of class for full credit. In the event that classes are cancelled due to weather on the date that an assignment is due, an extension to the following class will be granted to all students.

In the event you miss the midterm examination, there will be no opportunity to write a make-up exam. In this situation, the final exam score will be used in the place of the missing midterm mark.

In the event that you are sick and cannot write the final exam as scheduled, you must email me to let me know before the exam starts. You must also supply a doctor’s note within 48 hours of the end of the exam. You will only be excused from the exam and allowed to write a make-up exam if both these criteria are met. The make-up exam will be scheduled before the end of the exam period.

Course Content
Topics to be covered include:
- Ideal and non-ideal gases, equations of state
- First law of thermodynamics
- Types of chemical processes (isobaric, isochoric, and isothermal)
- Enthalpy, heat capacity, and thermochemistry
- Second law of thermodynamics
- Free energy, entropy, and chemical spontaneity
- Thermodynamics of equilibria and electrochemistry
- Phase equilibria
- Colligative properties
- Two-component phase diagrams

Some topics may not be covered (at the instructor’s discretion) if delays are experienced due to COVID-19 or inclement weather.
University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate.

Academic Integrity
At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility
The Advising and Access Services Centre is Dalhousie’s centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct
Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don’t follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can’t be reached, or would be inappropriate, procedures exist for formal dispute resolution.


Diversity and Inclusion – Culture of Respect
Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness.

Statement: http://www.dal.ca/cultureofrespect.html

Recognition of Mi’kmaq Territory
Dalhousie University would like to acknowledge that the University is on Traditional Mi’kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)
https://www.dal.ca/academics/important_dates.html

University Grading Practices
https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html
Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html


Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas


Safety

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html