



**DALHOUSIE
UNIVERSITY**

**Faculty of Science Course Syllabus
Department of Chemistry, Fall 2019**

CHEM 3301 - Quantum Mechanics and Chemical Bonding

Instructor: Aaron Kelly (aaron.kelly@dal.ca)

Office: Chemistry 526

Lectures: Tuesdays and Thursdays @ 8:35am - 9:55am

Location: Chemistry 540

Description: The fundamentals and postulates of quantum mechanics are developed from first principles, with applications to illustrative models for vibrations, rotations, atoms, and molecules.

Prerequisites: MATH 2001.03, MATH 2030.03, and CHEM 2304.03, (with a grade of C- or better)
PHYC 1190.03/1290.03 or 1300.06

Objectives and Learning Outcomes:

- Become conversant in the basic language of quantum mechanics.
- Become familiar with the standard models used in quantum chemistry: e.g. the 'particle in a box', the harmonic oscillator, the rigid rotor, and the Hydrogen atom.
- Introduction into spin, symmetry, and many-particle effects.
- Discover the relationship between quantum mechanics and chemical bonding.

Suggested Text: Introduction to Quantum Mechanics, David J. Griffiths
3rd Edition, Cambridge University Press

Course Content: As per lectures, course website, and assigned readings.

1. Some Historical Perspectives and Mathematical Preliminaries
2. The Foundations of Quantum Mechanics
3. A Selection of Paradigmatic Quantum Systems
4. Spin, Symmetry and Many-Particle Systems
5. Introduction to Polyatomic Systems and Chemical Bonding

Course Assessment: **Quiz** **Final Exam** **Assignments** **Essay**

25 % 40 % 25 % 10 %

Quiz Date: October 22 (Final scheduled by Registrar)

Assignments: Quasi-weekly problem sets, due in class.

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)

Course Policies

One (lowest) homework mark will be dropped.

Late assignments will not be accepted and will be assigned a mark of zero, unless students have made prior arrangements.

If a class is cancelled due to weather on the date that an assignment is due, an extension to the following class will be granted to all students.

If a student misses the midterm examination, there will be no opportunity to write a make-up exam. If the exam is missed due to illness or personal emergency, the student must contact the instructor and supply a doctor's note or other appropriate documentation, within 48 hours of the end of the exam. In this situation, the final exam score will be used in the place of the missing midterm mark.

If a student is sick and cannot write the final exam as scheduled, they must contact the instructor before the exam starts. They must also supply a doctor's note within 48 hours of the end of the exam. Students 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.

Use of cellular phones during lectures is strictly prohibited; phones must be turned off and put away before the start of the lecture.

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.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

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

Missed or Late Academic Requirements due to Student Absence (policy)

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.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

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.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>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.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>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

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>