DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Chemistry

CHEM 4105/5105
Inorganic Materials Synthesis
Winter 2023

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

We acknowledge the histories, contributions, and legacies of the African Nova Scotian people and communities who have been here for over 400 years.

Instructor: Dr. Mita Dasog mita.dasog@dal.ca

Contact information: If you have any questions, please email me. I will try to reply within 24 hours, although emails sent in the evening or on weekends may not be seen until the next business day. **Please use your Dalhousie email address for correspondence.**

Lectures: Monday, Wednesday, and Friday, 11.35 AM – 12.25 PM, Room: LSC 244

Course delivery: In person

Office Hours: Thurs 9.30 – 11 AM (or by appointment), Chemistry building room 432

Course Description
This course introduces students to the synthesis of advanced functional inorganic materials typically used in energy, optoelectronics, catalysis, and other applications. Topics in the course include solid-state synthesis, sol-gel synthesis, gas-phase synthesis, nucleation and growth of nanoparticles, thin film fabrication, and soft lithography.

Course Prerequisites
CHEM 2101 and CHEM 2301 or equivalent with a grade of C- or better

Learning Objectives
Upon completion of this course, students should be able to:

- Differentiate and describe various methods that can be used to synthesize inorganic materials.
- Discuss the advantages and disadvantages of each synthetic method.
- Discuss the underlying thermodynamic and kinetic principles for the synthesis of inorganic materials and for the formation of metastable products.
- Design suitable precursors (starting materials) for different synthetic methods.
- Critique the suitability of different synthetic methods to prepare materials for specific applications.

Course Materials
There is no formal textbook for this course. Class notes will be made available through the course website (Brightspace), and various reference books will be highlighted for further reading.

DALHOUSIE UNIVERSITY

Course Assessment

CHEM 4105 (Undergraduate students)

Assessment	Weight (%)	Date
Quizzes	20	See below
Midterm	25	March 3, 2023
Assignment	15	April 10, 2023
Final	40	Scheduled exam period

CHEM 5105 (Graduate students)

Assessment	Weight (%)	Date
Quizzes	20	See below
Midterm	20	March 3, 2023
Term paper	40	April 10, 2023
Presentation	20	April 5 & 7, 2023

Quizzes:

Quiz schedule

Quiz 1: January 20, 2023
Quiz 2: February 1, 2023
Quiz 3: February 17, 2023
Quiz 4: March 17, 2023
Quiz 5: March 31, 2023

Five quizzes will be given, and the lowest quiz grade will be dropped when calculating the final mark. **The quizzes will be held in class on the dates listed above. You will have 15 minutes to complete the quiz once you start.** The topics covered by each quiz will be posted on Brightspace.

Quizzes are **individual assessments**; therefore, collaboration of any sort is prohibited and will be considered academic misconduct. A missed quiz will be assigned a grade of zero unless you have contacted me within 24 hours of the scheduled quiz time.

***Homework assignment*:**

The homework assignment is designed to test your understanding of the lecture material and your ability to apply that knowledge to synthesize new materials. You may be asked to compare different synthetic techniques and identify ideal fabrication methods for a given situation. You may be asked to design precursors and plan syntheses for a specified material.

DALHOUSIE UNIVERSITY

The assignment will be made available ***at least*** two weeks in advance. **You will submit your assignment through Brightspace by 5:00 PM (AST) on the due date (April 10, 2023).** Late assignments are subjected to a 10% deduction for each late day. However, accommodations will be made under special circumstances. Please inform me of the situation as soon as you can and ideally before the due date.

You are encouraged to discuss assignment questions with other members of the class. You may also use the class lecture materials; however, the answers should be written in your own words and should not be identical to your classmates. Otherwise, it will be considered academic misconduct. You are not allowed to post assignment questions on student services websites such as Chegg. This will be considered academic misconduct.

Midterm: The midterm exam will be held on March 3rd, 2023 in class and will be closed book.

Term paper: The rubric and topic details for the term paper will be made available in January (on Brightspace). **The term paper is due on April 10th, 2023 by 5:00 PM (AST).** This will be worth 40% of your total grade. Plagiarism software will be used to check the term papers and any significant resemblance to previous work will be considered academic misconduct.

Oral presentations: Graduate students (CHEM 5105) will also give a 15-20 min presentation on their term papers in class.

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

Undergraduate (CHEM 4105):
The usual Faculty of Science scheme for converting numerical grades to letters will be used:

90-100 A+	85-89 A	80-84 A-	77-79 B+	73-76 B	
70-72 B-	65-69 C+	60-64 C	55-59 C-	50-54 D	0-49 F

Graduate (CHEM 5105):
The usual Faculty of Graduate Studies scheme for converting numerical grades to letters will be used in this class:

90-100 A+	85-89 A	80-84 A-	77-79 B+	73-76 B	70-72 B-	<70 F

Course Content

1. Introduction to materials science
2. Characterization of solids
3. Solid-state and solid-gas reactions
4. Precursor and low-temperature methods
5. Solids from gas phase (physical and chemical methods)
6. Colloidal synthesis

DALHOUSIE UNIVERSITY

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://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=-1&topicgroupid=31821&loaduseredits=False

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

DALHOUSIE UNIVERSITY

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.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.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

Dalhousie COVID-19 information and updates: https://www.dal.ca/covid-19-information-and-updates.html