

Analytic Function Theory Syllabus

Department of Mathematics and Statistics

MATH 4020/5020 Winter 2025

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Gisel Mattar Marriaga	gs618552@dal.ca	TBD, Chase 119

Course Description

Review of analytic complex functions including topological properties of the plane, exponential, logarithmic, trigonometric and related functions, integration and the Cauchy theorem. Cauchy's integral formula, residues, analytic continuation, entire and meromorphic functions, some results of conformal mapping and elliptic functions.

Course Prerequisites

MATH 2002 (MATH 3080 recommended)

Student Resources

Students are encouraged to contact the instructor with questions regarding assignments or lecture material. Ideally, bring your questions to the office hours. Emailing simple questions is also acceptable.

Course Structure

Course Delivery: Lectures will be held in-person and will not be recorded. Lecture notes will be uploaded to Brightspace each week.

Lectures: Tuesdays and Thursdays, 13:05-14:25 AST, at Chase 227.

Course Materials

- Required textbook: T. Gamelin, Complex Analysis, Undergraduate Texts in Mathematics Series, Springer-Verlag (2001).
- Lecture notes: In class notes and uploaded material.

Assessment

The final grades will be a combination of homework assignments, a mid-term and a final exam.

Assignments (40%)

- Homework will be assigned on a (roughly) bi-weekly basis and will be collected in class.
- Students are encouraged to resubmit their work to improve their grade. A maximum of two resubmissions per assessment will be accepted.

Mid-term (25%)

- In-class exam of approximately one hour.
- Tentative Date: Thursday, February 13th, 2025.

Final exam (35%)

- Date and Location TBD in Dalhousie's predetermined exam period.
- For students enrolled in 4020, the exam may contain optional bonus questions. Students enrolled in 5020 are expected to answer all the questions.

Conversion of numerical grades to final letter grades follows the

[Dalhousie Grade Scale](#)

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

Course Policies on Missed or Late Academic Requirements

- Students are expected to use the Student Declaration of Absence form for homework extension requests and can be used as many times as needed.
- If a student misses an assignment deadline, the instructor must be contacted, and a legitimate excuse must be provided. Arrangements can be made (following one-on-one discussions) for later submissions or substitutions.
- On missed midterm: Following the presentation of a valid excuse, the student will be allowed to take the test on a later date.

Course Policies related to Academic Integrity

Students are encouraged to work on their own, consult regularly with the instructor as they progress through the exercises, and submit individual homework assignments. If students do work together on assignments, they must include the names of the other students with whom they collaborated on their submitted material. The submissions cannot be identical, students are expected to write their own proofs even when working with others.

If you use ChatGPT or another type of AI, please indicate this on your submitted assignments.

Learning Objectives

In this course, students are expected to develop a solid understanding of the one-dimensional theory of complex variables and analytic functions. Students will also refine their ability to organize mathematical arguments and write clear and complete proofs.

Specific outcomes for the student are:

- Familiarity with the theory of analytic functions as presented in the course.
- The ability to use concepts from the course to analyze novel problems appropriate to the level of the course.
- Refined skill in creating clear and correct mathematical texts.

Course Content

The following list contains the main topics to be covered on this lecture course, and the estimated time to be spent on each topic.

1. Complex numbers and elementary functions (2 weeks)
 - Review of complex numbers
 - Exponential, Logarithmic and Trigonometric functions

2. Analytic Functions (2 weeks)
 - Complex differentiation
 - The Cauchy-Riemann equations
 - Inverse and conformal mappings
 - Fractional linear transformations

3. Complex Integration (3 weeks)
 - Line Integrals
 - Antiderivatives
 - Cauchy's theorems for complex integrals

4. Power Series and Laurent Series (4 weeks)
 - Power Series and the zeros of analytic functions
 - Analytic Continuations
 - Laurent Series and isolated singularities

5. The Residue Theorem (1 weeks)

University Policies and Statements

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 at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about-dal/internationalization.html>

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all 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. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html>)

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

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 (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: <http://www.dal.ca/cultureofrespect.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. The full Code of Student Conduct can be found at: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: <https://www.dal.ca/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.html>

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.