MATH 3260 - Complex Analysis

Winter 2021

Department of Mathematics & Statistics
University of Guelph

Calendar Description

This course extends calculus to cover functions of a complex variable; it introduces complex variable techniques which are very useful for mathematics, the physical sciences and engineering. Topics include complex differentiation, planar mappings, analytic and harmonic functions, contour integration, Taylor and Laurent series, the residue calculus and its application to the computation of trigonometric and improper integrals, conformal mapping and the Dirichlet problem.

Course Weight: 0.50
Prerequisites: MATH*2200
Class Schedule and Location: MWF 9:30-10:20 via Zoom

Instructor: Prof. A. Willms
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Office Location: MACN 512
Office Hours: TBA

GTA: Ningping Cao
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Content

- Complex numbers, cartesian and polar forms, basic operations, Euler's formula and the exponential form, conjugation, de Moivre's Theorem, roots and powers, Riemann sphere.
- Functions of complex variables, multi-valued functions, visualizing complex functions, various elementary functions
- Complex differentiation, geometric interpretation, the Cauchy-Riemann equations, analytic and harmonic functions, derivatives of elementary functions, singularities, branch cuts, Riemann surfaces.
- Contour integration, arcs, contours and parameterizations.
- Cauchy-Goursat Theorem and its consequences, Cauchy's integral formulas and their consequences.
- Series Representations, convergence, power series, Taylor's series, Laurent series.
- Residues, calculation, The Residue Theorem, evaluation of certain real integrals.
- Additional topics as time permits.

Lectures will be delivered live via Zoom at 9:30am MWF. The zoom link will be available from the course web page. These lectures will be recorded and the recordings will be available on the course web page. Reproduction of lecture recordings is strictly prohibited.

Evaluation

Assessment	date/time	weight
6 Assignments	Fridays: Jan. 15, Jan. 29, Feb. 12, Mar. 5, Mar. 19. Monday Apr. 5, 5:00pm	40%
6 Quizzes	Fridays: Jan. 22, Feb. 5, Feb. 26, Mar. 12, Mar. 26, Apr. 9, 9:30am	40%
Take home Final Exam	Out Wed. Apr. 14, 9:30am. Due Sat. Apr. 17 9:30am	20%

Late assignment submissions will not be accepted.

Texts

Required:

- *MATH*3260 Complex Analysis Course Notes* by Allan R. Willms, University Bookstore.

These course notes are printed black and white to keep costs down. Colour versions of the figures are available on the course web page.

Recommended text books for reference:

- *Schaum's Outlines: Complex Variables, 2nd Edition* by Murray R. Spiegel, Seymour Lipschutz, John J. Schiller, and Dennis Spellman. McGraw-Hill 2009.
- *Fundamentals of Complex Analysis*, 3rd Edition, E.B. Saff and Arthur D. Snider. Prentice Hall, 2003.
- *Complex Variables and Applications*, 8th ed., James W. Brown and R.V. Churchill, McGraw-Hill, 2009.
- *Visual Complex Analysis*, Tristan Needham, Oxford University Press, 1997.

Grading Policies

Quizzes and assignments will be submitted and marked via Crowdmark. They will be returned electronically as quickly as possible. Marks will be available on courselink. It is the student's responsibility to check that the posted marks are accurate. All requests for reassessment of quizzes or assignments **must** follow the procedures outlined on the course web page.

Suggested Homework Problems

I will post a number of suggested problems (apart from homework assignments) as we cover the topics from each section. I strongly encourage you to both read the relevant sections in the course notes and attempt the suggested problems. You should do as many of these suggested problems as you need in order to understand the material. If after doing a few similar problems you have mastered one concept, feel free to skip the remaining suggested problems that deal with the same concept.

As a general guideline, I expect students to spend about six or seven hours per week (in

addition to lectures) reading the course notes, doing homework problems, and studying.

University Policies

Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website https://news.uoguelph.ca/2019-novel-coronavirus-information/ and circulated by email.

Illness

The University will not require verification of illness (doctor's notes) for the fall 2020 or winter 2021 semesters.

E-mail Communication

As per university regulations, all students are required to check their *uoguelph.ca* e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration.

Drop Date

Courses that are one semester long must be dropped by the end of the last day of classes; two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

Copies of out-of-class assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student. When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim

accommodations may be possible while that process is underway. Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to make a booking at least 7 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time. More information: www.uoguelph.ca/sas

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.
The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

Recording of Materials

Presentations which are made in relation to course work, including lectures, cannot be recorded in any electronic media without the permission of the presenter, whether the instructor, a student, or guest lecturer. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the presenter.

Resources

The Academic Calendars are the source of information about the University of Guelph’s procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.