UNIVERSITY of GUELPH

MATH*3260 Complex Analysis

Winter 2020
Section(s): C01

Department of Mathematics & Statistics
Credit Weight: 0.50
Version 1.00 - December 18, 2019

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1 Course Details

1.1 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.

Pre-Requisites: MATH*2200

1.2 Course Description

Lecture Content

- Complex numbers, basic operations, polar form, Euler's formula and de Moivre's Theorem, roots and powers, Riemann sphere.
- Elementary functions of complex variables, branch points and branch lines, Riemann surfaces, limits, sequences, continuity.
- Complex differentiation, the Cauchy-Riemann equations, analytic and harmonic functions, derivatives of elementary functions, singularities, differential operators.
- Contour integrals, complex integration, the Cauchy-Goursat Theorem and its consequences.
- Cauchy's integral formulas and their consequences.
- Sequences and series of functions, absolute and uniform convergence, Taylor and Laurent series, classification of singularities, analytic continuation.

- Residue Theorem, evaluation of integrals.
- Possibly some of: Conformal mapping, Riemann's mapping theorem, special mappings, Fourier transforms.

1.3 Timetable

MWF 9:30-10:30 in MCKN 231.

1.4 Final Exam

Monday, April 20, 19:00-21:00.

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2 Instructional Support

Instructor: Prof. A. Willms, MACN 512

TA: Ningping Cao

Office hours: Mon. and Wed. 13:30-15:00 in MACN 512, or by appointment.

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3 Learning Resources

We will be using a free online text book by Steven Krantz. The other text books listed are on reserve in the library and are a good resource.

3.1 Required Resources

Complex Variables: A Physical Approach (Textbook)
http://www.freebookcentre.net/maths-books-download/Complex-Variables-A-Physical-Approach.html
Steven G. Krantz, free e-book

3.2 Additional Resources

Schaum's Outlines: Complex Variables, 2nd ed. (Textbook)
Murray R. Spiegel, Seymour Lipschutz, John J. Schiller, and Dennis Spellman. McGraw-Hill 2009.

Fundamentals of Complex Analysis, 3rd ed. (Textbook)
E.B. Saff and Arthur D. Snider. Prentice Hall, 2003.

Complex Variables and Applications, 8th ed. (Textbook)
James W. Brown and R.V. Churchill, McGraw-Hill, 2009.

Visual Complex Analysis (Textbook)
Tristan Needham, Oxford University Press, 1997.

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4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Complete basic mathematical operations using complex numbers.
2. Understand the idea of branches of multi-valued functions.
3. Understand concepts associated with analytic functions including the differentiability, Cauchy-Goursat Theorem and its consequences, and Cauchy's Integral formulas and their consequences.
4. Have an understanding of different types of singularities.
5. Be able to compute Taylor and Laurent series for various functions.
6. Compute various improper real-valued integrals using residue theory.

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5 Teaching and Learning Activities

I will post a large number of suggested problems from the text book as we cover the topics from each section. I strongly encourage you to both read the relevant sections in the text and attempt the suggested problems in the week they are scheduled. 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. Worked solutions and answers to many problems are available in the text.

As a general guideline, I expect students to spend about six or seven hours per week (in addition to lectures) reading the text book, reviewing lecture notes, doing homework problems, and studying.

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6 Assessments

6.1 Marking Schemes & Distributions

The quizzes will take place at the start of class on Wednesdays starting January 15. Since only the best 8 will count toward any student's mark, there normally will be no accommodation for missing a quiz.

Quizzes and the midterm test will be marked as quickly as possible and returned via Crowdmark. All requests for reassessment of quizzes or the midterm **must** follow the procedures outlined on the course web page.

Name	Scheme A (%)
Best 8 of 11 Quizzes	30
Midterm test	30
Exam	40
Total	100

7 University Statements

7.1 Email Communication

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

7.2 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. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

7.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes

https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

7.4 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.

7.5 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 book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website
https://www.ridgetownc.com/services/accessibilityservices.cfm

7.6 Academic Integrity

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 encourages academic integrity. 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.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

7.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

7.8 Resources

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

Academic Calendars
https://www.uoguelph.ca/academics/calendars

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