Acknowledgement

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xʷməθkʷəy̓əm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on in their culture, history, and traditions from one generation to the next on this site.

Course Information

Course Title	Course Code Number	Credit Value
Applied Complex Analysis	MATH 305:201	3

Time and Room: MWF 12-1pm, through Zoom

Prerequisites

One of MATH 200, MATH 217, MATH 226, MATH 253, MATH 254
and one of MATH 215, MATH 255, MATH 256, MATH 258

Corequisites

One of MATH 256, MATH 257, MATH 316, MATH 358, MECH 358, PHYS 312

Contacts

Course Instructor(s)	Contact Details	Office Location	Office Hours
Sven Bachmann	By email: sbach@math.ubc.ca	(MATH 228)	Wed 11-12

Other Instructional Staff

TA: Jacob Stockton jstockton@math.ubc.ca

Course Structure & Learning Outcomes

The three weekly lectures, to be held on Zoom, aim at a non pedantic and enlightening exposition of the central mathematical results of complex analysis, illustrated by few examples. They are complemented by the homework exercises which are an essential part of the learning process. Student participation in the live sessions will be through the Zoom chat, while live questions can be asked during an optional, 15 minutes-long Q&A session running directly after the end of the lectures.

Students will further benefit from reading the corresponding material in the textbook, which provides a slightly different perspective on the topics and covers many more examples.

Having reviewed basics of complex numbers and the complex plane $\mathbb{C}$, this course concentrates on analytic aspects of functions defined on $\mathbb{C}$ and taking values in $\mathbb{C}$. It will cover differentiation and integration and focus on the fundamental difference between the plane $\mathbb{R}^2$ and the complex plane $\mathbb{C}$. Complex functions are ubiquitous in science and engineering, in particular through the computational power associated with complex integration as well as in understanding the solutions of differential and finite difference equations.

Schedule of Topics

1. Preliminaries
   - Complex numbers
   - Polar form, powers and roots
   - Sets in the complex plane and mappings
2. Functions
   - Differentiability and the Cauchy-Riemann equations
   - Holomorphic functions
   - Power series
   - The exponential and logarithm functions
3. Integration
   - Contours and integration along contours
   - Primitives
4. Cauchy's theorem and applications
   - Cauchy's theorem and Cauchy's integral formulas
   - Toy contours and evaluation of integrals
   - Liouville's theorem
   - The fundamental theorem of algebra
5. Meromorphic functions
   - Zeros and poles
   - Laurent series
   - The residue formula
   - Evaluation of integrals
   - The argument principle and the Nyquist criterion

6. The Fourier transform
   - Fourier and inverse Fourier transforms
   - Elementary properties
   - Application to differential equations

Learning Materials

There will be weekly lecture notes posted on the course's Canvas page. The weekly homework assignments and their solutions will be posted there as well. All important announcements will be communicated through Canvas.

The Zoom sessions will be recorded and posted on Canvas.

We will not follow any textbook explicitly. The reference textbook is
Fundamentals of Complex Analysis: with Applications to Engineering and Science by E. Saff and A.D. Snider
There are many other excellent elementary texts, such as
Princeton Lectures in Analysis II: Complex Analysis by E.M. Stein and R. Shakarchi
Complex Analysis by E. Stuart and D. Tall

Discussions forums. The Piazza page is exclusively for the students and will only be monitored by the teaching team to ensure that the discussions remain within the academic policies. Questions can be posted on the 'Discussions' tab of Canvas, which allows for mathematical formulas. Students are encouraged to answer those questions, and the teaching team will participate if needed.

Assessments of Learning

There will be

1. weekly homework assignments due Fridays at 12:00pm,
2. two midterm exams, on Wednesday February 10 and Wednesday March 17, lasting 50 minutes,
3. one final exam to be scheduled in the exam period.

Cheating will not be tolerated.

All course material, including the reference textbook, is allowed. The use of any other resource, such as mathematical software and various websites (such as Wolframalpha, Desmos) or tutoring sites (such as Chegg) is strictly prohibited. Sharing of exam questions online is considered cheating, as is any form of communication with a third party, for example in chatrooms.

Invigilation of exams is through Zoom. All students must have their camera turned on, be present during the exam and be able to show their student's ID upon request; failure to do so will be considered a case of academic misconduct.

Final Grade

The final grade is computed as such:

Homework: 20%; Midterms: 20% each; Final: 40%.

In calculating your score for the homework, I will drop your lowest score. These include missed assignment.

Missing the midterm: There is no make-up midterm. Missing the midterm for a valid reason normally results in the weight of that midterm being transferred to the final exam, resulting in HW: 20%, M: 20%, F: 60% . Examples of valid reasons include illness and travel to play a scheduled game for a varsity team. Examples of reasons that are not valid include conflicts with personal travel schedules or conflicts with work schedules. Any student who misses a test is to present to their instructor the Department of Mathematics self-declaration form for reporting a missed assessment to their instructor within 72 hours of the midterm date.

You must finish a significant amount of term work in order to pass.

In the case of the final exam, the students should contact the Department of Mathematics and the missed final will be handled in a formal way.

On submitted work:

All assertions require an argument unless the problem states otherwise. No matter the operative word ('find', 'solve', 'establish', 'calculate', 'determine',...), you must justify your answer.
Written work should be presented carefully, in complete English sentences, and with sufficient detail. A correct sequence of formulas will only receive partial credit, an unstructured cloud of formulas and incoherent text will receive none.

University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website.

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