

THE CHINESE UNIVERSITY OF HONG KONG
Department of Mathematics
MMAT 5220 (Term 2, 2019-20)
Complex Analysis and Its Applications
Course Outline

Outline

This course is designed for the M.Sc. Programme in Mathematics. It intends to provide an introduction to the analysis and applications of analytic functions on the complex plane. Emphasis will be placed on the understanding and appreciation of the theory as well as its wide range of usage. Topics include the study of integrals, residues, series expansions, conformality of analytic functions, transforms and their use in differential equations.

Prerequisites

Students taking this course should be familiar with calculus of functions with two or more variables.

Class Information

- Instructor: CHAN Kwok Wai (Office: LSB 212; Email: kwchan@math.cuhk.edu.hk)
- Teaching Assistant: CHEUK Tak Ming (Office: LSB 228; Email: tmcheuk@math.cuhk.edu.hk)
- Lectures: Thu 6:30pm - 9:15pm at YIA LT8
- Webpage: <https://www.math.cuhk.edu.hk/course/1920/mmat5220>

Suggested Texts

- Lecture notes available at the course webpage.
- *Complex Variables and Applications*, J. W. Brown & R. V. Churchill, 9th ed, McGraw Hill.
- *Complex Analysis*, Lars V. Ahlfors, 3th ed, McGraw Hill.
- *Complex Analysis*, Elias M Stein & Rami Shakarchi, Princeton University Press.

Assessment

- 20%: Homework
- 30%: Midterm (19th Mar 2020)
- 50%: Final (23rd Apr 2020)

Tentative Schedule

- Complex plane and elementary functions
- Limits, continuity, differentiability; Cauchy-Riemann equations
- Analytic functions; contour integrals
- Cauchy-Goursat Theorem and simply-connectedness
- Cauchy integral formula, Liouville's Theorem and Maximum Modulus Principle
- Series and convergence
- Laurent's Theorem; zeros and uniqueness of analytic functions
- Isolated singular points and residues
- Applications of residues
- Rouché's Theorem and Open Mapping Theorem
- Conformal mapping; Schwarz Lemma
- Riemann Mapping Theorem