MATH4023 Complex Analysis
L1 (Spring 2026) Course Outline

1. Instructor

Name:	Dr. CHENG Kam Hang Henry
Office:	Room 3486 (L25–26)
Email:	keroc@ust.hk
Office hours:	(Tentative) Wed 15:30 – 17:30; You may also just drop in my office any time or make an email appointment beforehand to ensure I am there.

2. Teaching assistants

(T1A)		(T1B)	
Name:	Ms. HUO Mengyu	Name:	Mr. MOK Wan Hin Johnson
Email:	mhuoaa@connect.ust.hk	Email:	whmok@connect.ust.hk

3. Meeting time and venue

Lectures:	(L1)	Tue & Thu 10:30 – 11:50	4620 (L31–32)	
Tutorials:	(T1A)	Thu 18:00 – 18:50	4504 (L25–26)	(Starting on **Feb 12**)
	(T1B)	Wed 18:00 – 18:50	2302 (L17–18)	(Starting on **Feb 11**)

Course website: https://canvas.ust.hk/courses/69446

4. Course description

This course is about the study of **functions of one complex variable**. Major topics include: point-set topology; limits and continuity; holomorphic functions; Cauchy-Riemann equations; power series; complex line integrals; Cauchy's theory and its consequences; Taylor series; isolated singularities and Laurent series; Cauchy's residue theorem; conformal mappings.

Credit points:	3
Prerequisite:	**Multivariable calculus** (MATH2011/2023/3043) and **mathematical analysis** (MATH2033/2043) For those who have not taken **real analysis** (MATH2043/3033): Although MATH3033 is not listed as an official prerequisite, it will be quite helpful if you are already familiar with the concept of **uniform convergence**.

5. Intended learning outcomes (ILOs)

Upon successful completion of this course, students are expected to be able to:

1. apply the concept of limits to analyze and solve problems related to continuity and approximation in the mathematical profession;
2. compute contour integrals of complex functions and Laurent series of meromorphic functions, and explain these computations clearly using concepts from complex analysis;
3. recognize the power of Cauchy's theory that made some difficult problems solvable, and apply logical reasoning to investigative mathematical work; and
4. develop mathematical maturity to undertake higher level studies in mathematics and related fields.

6. Assessment scheme

- **Assignments (10% + Bonus 4%)**: Assessing ILOs 1, 2, 3 and 4
  Homework will be assigned from time to time. You will be required not only to compute numerical answers, but also to write down full solutions in a rigorous manner. You may have peer discussion on the solutions, or consult any generative AI tool, provided that you properly acknowledge each person and/or generative AI tool you have obtained help from. You need to submit solutions that are individually written **on your own**; directly copying solutions from each other or directly copying outputs from generative AI tools will result in a zero score.
  You should submit each homework in the form of either a clearly written and scanned or a neatly LaTeX-typed **PDF file** on the **Canvas** system before the deadline. Feedback will be given on your work within two weeks from the submission deadline, so that you can improve.

- **Midterm Test (30%)**: Assessing ILOs 1, 2, 3 and 4
  The mid-term test will be scheduled on **Thursday, April 2 from 19:30 to 21:30**. It will tentatively cover all materials from chapters 1 to 3 of the lecture notes.

- **Final Exam (60%)**: Assessing ILOs 1, 2, 3 and 4
  The final exam will take three hours, and the schedule will be announced in due course. All materials taught in the course will be tested in the final exam.

The mid-term test and the final exam will normally be **closed-book written tests**, and you will be allowed to use an **HKEAA-approved** handheld calculator during the tests. The exact exam arrangements may be modified in the event of unexpected emergencies.

Letter grades:

The assignment of letter grades is **criterion-referenced** according to the grade descriptors below. In particular, the grading scheme is neither "absolute" nor "on a curve". Although the exact "grade boundaries" vary due to the difficulty of the assessments, students should generally aim at getting a course total of 80% or above for A-/A/A+, and about 60% or above for B-/B/B+.

Grade descriptors:

Grades	Short description	Elaboration on subject grading description
A	Excellent	The student has mastered almost all concepts and techniques of complex analysis taught in the course, and has excellent and thorough understanding on the subject content.
B	Good	The student has mastered most computational techniques about functions of a complex variable taught in the course, yet the understanding of some challenging concepts may not be deep enough.
C	Satisfactory	The student meets the minimum expectation of the instructor, has acquired some basic computational techniques about functions of a complex variable, but some concepts were not clearly understood.
D	Marginal pass	The student is only able to recall some fragments of topics and is able to complete some of the most elementary computations about functions of a complex variable.
F	Fail	The student does not have sufficient understanding of even some fragments of topics, and is not even able to complete elementary computations about functions of a complex variable.

Academic integrity:

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to [Academic Integrity | HKUST – Academic Registry] for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

7. Student learning resources

- Main reference: Lecture note by the instructor
  (Accessible via our course website https://canvas.ust.hk/courses/69446)

- Other reference texts:
  J. Bak and D. Newman, *Complex Analysis* (3rd ed.), Springer UTM.
  T. W. Gamelin, *Complex Analysis*, Springer UTM.
  E. M. Stein and R. Shakarchi, *Complex Analysis*, Princeton Uni. Press. (Ch. 1 – 3 only)
  Y. K. Kwok, *Applied Complex Variables for Scientists and Engineers* (2nd ed.), Cambridge Uni. Press. (this is a reference containing many applications suitable for engineers)

8. Tentative course schedule

Week	Lecture dates	Topics
1	Feb 3, Feb 5	Complex number arithmetics
		Sequences and series of complex numbers
2	Feb 10, Feb 12	Point-set topology in $\mathbb{C}$: open sets, closed sets
		Compactness, connectedness
3	Feb 24, Feb 26	Functions in a complex variable, Limits and continuity
4	Mar 3, Mar 5	Holomorphic functions, Cauchy-Riemann equations
		Complex exponential and trigonometric functions
5	Mar 10, Mar 12	Sequences and series of complex functions
		Power series
6	Mar 17, Mar 19	Line integrals in the complex plane
		Antiderivatives, Cauchy-Goursat Theorem
7	Mar 24, Mar 26	Cauchy integral formula
		Complex logarithms
8	Mar 31, Apr 2	Taylor series of a holomorphic function
		Morera's Theorem
9	Apr 9	Maximum modulus principle, Schwarz lemma
10	Apr 14, Apr 16	Liouville's Theorem
		Isolated singularities
11	Apr 21, Apr 23	Laurent series
		Residues
12	Apr 28, Apr 30	Argument principle, Rouché's Theorem
13	May 5, May 7	Any other selected topic(s) and/or Final review