City University of Hong Kong
Course Syllabus

offered by College/School/Department of Mathematics
with effect from Semester A 20 20 / 21

Part I Course Overview

Course Title:	**Complex Analysis**
Course Code:	**MA3517**
Course Duration:	**One semester**
Credit Units:	**3**
Level:	**B3**
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	**English**
Medium of Assessment:	**English**
Prerequisites: *(Course Code and Title)*	**MA2508 Multi-variable Calculus**
Precursors: *(Course Code and Title)*	**Nil**
Equivalent Courses: *(Course Code and Title)*	**Nil**
Exclusive Courses: *(Course Code and Title)*	**Nil**

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to provide an introduction on the theory and applications of functions of a complex variable. It will help students to understand the basic theory of complex analysis and apply the methods to solve problems in physics and engineering.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	explain at high level concepts from complex analysis, including analyticity of functions and conformality of mappings.	10%	✓		
2.	state and prove rigorously mathematical statements concerning analytic functions.	15%	✓		
3.	generate power series and Laurent series expansions of complex-valued functions.	15%		✓	
4.	evaluate line/contour integrals directly or by using the residue theorem, and compute real integrals via contour integration.	20%		✓	
5.	determine images of curves and sets under complex mappings, particularly conformal maps.	10%		✓	
6.	apply techniques of complex analysis in other mathematical and scientific applications, such as Laplace and Fourier transforms.	20%	✓	✓	✓
7.	the combination of CILOs 1-6	10%	✓	✓	✓
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.							Hours/week (if applicable)
		1	2	3	4	5	6	7	
Lecture	Learning through **teaching** is primarily based on lectures.	Y	Y	Y	Y	Y	Y	Y	39 hours in total
Take-home assignments	Learning through **take-home assignments** helps students understand basic concepts of complex analysis and practise techniques of series expansion and contour/real integral computation.	Y	Y	Y	Y	Y	Y		after-class
Online applications	Learning through **online examples for applications** helps students create and formulate mathematical models in science/engineering with techniques of complex analysis.						Y		after-class
Math Help Centre	Learning activities in **Math Help Centre** provides students extra help.	Y	Y	Y	Y	Y	Y		after-class

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

30% Coursework

70% Examination (Duration: 2 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Tasks/Activities	CILO No.							Weighting*	Remarks
	1	2	3	4	5	6	7		
Continuous Assessment: 30 %									
Test	Y	Y	Y					15-30%	Questions are designed for the first part of the course to see how well students have learned the concept of analyticity of complex-valued functions and its function-theoretic consequences.

Hand-in assignments	Y	Y	Y	Y	Y	Y		0-15%	These are skills based assessment to enable students to apply basic concepts and techniques of complex analysis in proving mathematical statements, evaluating real/contour integrals, performing integral transforms and modeling a range of scientific applications.
Formative take-home assignments	Y	Y	Y	Y	Y	Y		0%	The assignments provide students chances to demonstrate their achievements on methods of complex analysis learned in this course.
Examination: _70___% (duration: 2 hrs, if applicable)									Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be skills and understanding based to assess the student's versatility in complex analysis and its applications.
** The weightings should add up to 100%.*								100%	

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Test	ABILITY to APPLY and EXPLAIN the methodology of limits, derivatives, integrals of functions of one complex variable.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	CAPACITY for SELF-DIRECTED LEARNING to understand the properties of complex functions, in particular, the analytic functions.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Formative take-home assignments	CAPACITY for SELF-DIRECTED LEARNING to apply principles of complex analysis to some problems in science and engineering	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	ABILITY to DEVELOP mathematical models through complex analysis and SOLVE problems with different methods	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

Functions of a complex variable. Cauchy-Riemann equations. Conformal mapping. Analytic functions. Contour integrals. Cauchy integral theorem. The residue theorem. Laplace and Fourier transforms.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Complex variables and applications, by Ruel V. Churchill, James Ward Brown.
2.	
3.	
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2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Fundamentals of complex analysis with applications to engineering and science, by E.B. Saff, A.D. Snider.
2.	Complex analysis: an introduction to the theory of analytic functions of one complex variable, by Lars V. Ahlfors.
3.	A collection of problems on complex analysis, by L.I. Volkovyskii, G.L. Lunts, I.G. Aramanovich.
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