City University of Hong Kong
Course Syllabus

offered by College/School/Department of _Mathematics_____
with effect from Semester __B____ 20_17_ / _18_

Part I Course Overview

Course Title:	**Asymptotic Analysis**
Course Code:	**MA4547**
Course Duration:	**One semester**
Credit Units:	**3 credit units**
Level:	**B4**
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)*	**MA3511 Ordinary Differential Equations** **MA3517 Complex Analysis**
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 introduce basic notions of asymptotic analysis with application to ordinary differential equations. It helps students understand how to find approximate solutions to algebraic and differential equations, as well as how to find asymptotic behaviours of certain integral transforms.

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 clearly the meaning of asymptotic expansions and related notations.	20%	✓		
2.	Find asymptotic behaviours of integrals using Watson's lemma and Laplace's method.	20%	✓	✓	
3.	Find asymptotic behaviours of complex integrals using the method of stationary phase.	15%		✓	
4.	Compute asymptotic solutions of certain algebraic equations.	15%		✓	
5.	Apply perturbation theory to find asymptotic solutions of certain ordinary differential equations.	15%			✓
6.	Perform WKB analysis to find asymptotic solutions of linear ordinary differential equations.	15%		✓	✓
	** If weighting is assigned to CILOs, they should add up to 100%.*	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**	
Lectures	Learning through **teaching** is primarily based on lectures.	✓	✓	✓	✓	✓		39 hours in total
Take-home assignments	Learning through **take-home assignments** helps students understand basic techniques of asymptotic analysis and their applications to ordinary	✓	✓	✓	✓			after-class

	differential equations.							
…								

4. Assessment Tasks/Activities (ATs)

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

40% Coursework

60% Examination (Duration: 2 hours, at the end of the semester)

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3	4	5	6		
Continuous Assessment: _40___%								
Test	✓	✓	✓				20-40%	Questions are designed for the first part of the course to see how well the students have learned basic concepts and techniques of asymptotic expansions.
Hand-in assignments	✓	✓	✓	✓			0-20%	These are skills based assessment to help students understand techniques of asymptotic analysis and related applications.
Formative take-home assignments	✓	✓	✓	✓			0%	The assignments provide students chances to demonstrate their achievements in applying techniques of asymptotic analysis learned from this course.
Examination: _60___% (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 asymptotic analysis and related 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 in problem solving	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	Understanding of concepts and applications	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Formative take-home assignments	Study attitude	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	Comprehensive ability in independent problem solving	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.)

Asymptotic series. Watson's lemma. Laplace's method. Method of stationary phase. Perturbation theory. WKB analysis.

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.	Murray, J.D. Asymptotic Analysis (Applied Mathematical Sciences, Vol. 48), Springer, 1984. (Reference book)
2.	
3.	
…	

2.2 Additional Readings

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

1.	
2.	
3.	
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