City University of Hong Kong
Course Syllabus

offered by Department of Computer Science
with effect from Semester A 2024/25

Part I Course Overview

Course Title:	Cloud Computing: Theory and Practice
Course Code:	CS5296
Course Duration:	One semester
Credit Units:	3 credits
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	CS5222 Computer Networks and Internets
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course aims to examine the critical technology trends of cloud computing, in particular, the architecture and design of existing deployments, the services and applications that cloud computing can offer, and the challenges that need to be addressed to help cloud computing reach its full potential. In addition to understanding the core technologies in cloud computing, students are expected to apply this knowledge in a critical evaluation of emerging cloud computing platforms and services and to acquire an appreciation of cloud management tools through hands on laboratory exercises.

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 the overall concepts and underlying technologies of cloud computing applications including the essential characteristics and service models.	10%	✓	✓	
2.	Explain the underlying principles of different virtualization technologies, cluster scheduling and management, and job scheduling.	25%		✓	
3.	Explain the underlying technologies of distributed systems in the cloud, for example distributed storage systems and data center networks, for enabling the cloud to deliver performance to various applications.	25%		✓	
4.	Apply cloud computing techniques and use relevant tools, such as Hadoop, to design applications in the cloud environment and utilize cloud management tools to provide resources provisioning and monitoring.	30%	✓	✓	✓
5.	Explore data and model parallelism for machine learning in data centers, and identify the security issues in both private and public cloud computing systems and possible solutions.	10%		✓	✓
		100%			

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 real-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. Learning and Teaching Activities (LTAs)

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

LTA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lecture	Students will engage in lectures covering the essential concept, common platforms and core technologies in mobile application development.	✓	✓	✓	✓	✓	2
Tutorial / Laboratory exercises	In tutorials, students will engage in case studies, analytical questions and answers, and hands on laboratory exercises. Case studies and analytical questions are designed to review the material covered in the lectures, widen students' exposure on the related topics and creatively apply concepts learned to new scenarios. Laboratory exercises provide an opportunity for students to use cloud management tools for resource provisioning as well as security and performance monitoring.	✓	✓	✓		✓	1
Programming assignments	In the programming assignment students will use software tools and programming interfaces in common cloud platforms to develop small functional programs to satisfy specific user requirements.				✓		0.5
Research paper review	Students are required to present or criticize two research papers chosen from a list given by the instructor in the lectures. One student will present the paper with a summary of technical contributions; another student will criticize the limitations of the paper by asking questions. Students will have the opportunity to study the latest progress in the fast-changing cloud computing field, improve their critical thinking, and identify potential research topics in this area.	✓	✓	✓		✓	0.5
Group project	In the group project, students will demonstrate their understanding of the key technical issues. Students will choose their own topic of study and apply their knowledge creatively to analyse the problem and arrive at the solutions.	✓	✓	✓		✓	1

4. Assessment Tasks/Activities (ATs)

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

Assessment Tasks/Activities	CILO No.					Weighting	Remarks
	1	2	3	4	5		
Continuous Assessment^: 60%							
Programming assignment				✓		20%	
Research paper review	✓	✓	✓		✓	15%	
Group project	✓	✓	✓		✓	25%	
Examination^: 40% (duration: 2 hours)	✓	✓	✓	✓	✓	40%	
						100%	

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

5. Assessment Rubrics

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

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Programming assignment	Whether students can independently and correctly write Hadoop programs to solve the given data analytical tasks	The answer is correct. The code is independently written with clear structure.	The answer is mostly correct, with some mistakes. The code is independently written with clear structure.	The answer is mostly incorrect. The code is independently written with clear structure.	The answer is wrong. The code is messy.	No submission/meaningful solution presented in the submission.
2. Research paper review	Whether students can correctly summarize the main novelty and contributions of the paper, criticize its limitations, relate to other efforts in the field, and give a clear presentation about the results	The summary is correct and concise. The analysis of novelty and technical contributions is thorough. The critique is interesting and sound. The presentation is clear.	The summary is mostly correct. The analysis of novelty and technical contributions is thorough. The critique is interesting. The presentation is clear.	The summary is largely correct with some mistakes. The analysis of novelty and technical contributions has biases and misunderstanding. The critique is not sound. The presentation is okay.	The summary has some mistakes. The analysis of novelty and technical contributions has misunderstanding. The critique is missing. The presentation is not clear.	No presentation/critique/notes is given.
3. Group project	Whether students can apply the knowledge learned to creatively analyse a subject of study chosen by themselves, and give a clear presentation about the results	The topic of study is interesting. The analysis is thorough and creative, with a research component. The presentation is clear.	The topic of study is interesting. The analysis is mostly thorough. The presentation is clear.	The topic of study is conventional and does not require much study. The analysis is not interesting. The presentation is clear.	The topic of study is conventional and does not require much study. The analysis is not interesting. The presentation is not good.	No presentation is given.
4. Exam	Whether students can answer all questions correctly.	Depending on the rubrics of the final exam paper	Depending on the rubrics of the final exam paper	Depending on the rubrics of the final exam paper	Depending on the rubrics of the final exam paper	Score less than 30%, or fail to be present for the exam.

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Programming assignment	Whether students can independently and correctly write Hadoop programs to solve the given data analytical tasks	The answer is correct. The code is independently written with clear structure.	The answer is mostly correct, with some minor mistakes. The code is independently written with clear structure.	The answer is mostly incorrect and messy. The code is independently written with clear structure.	No submission/meaningful solution presented in the submission.
2. Research paper review	Whether students can correctly summarize the main novelty and contributions of the paper, criticize its limitations, relate to other efforts in the field, and give a clear presentation about the results	The summary is correct and concise. The analysis of novelty and technical contributions is thorough. The critique is interesting and sound. The presentation is clear.	The summary is mostly correct. The analysis of novelty and technical contributions is thorough. The critique is interesting. The presentation is clear.	The summary is largely correct with some mistakes. The analysis of novelty and technical contributions has biases and misunderstanding. The critique is not sound. The presentation is okay.	No presentation/critique/notes is given. Or the summary is totally wrong, and the analysis of novelty and technical contributions is misunderstanding, and the critique is missing.
3. Group project	Whether students can apply the knowledge learned to creatively analyse a subject of study chosen by themselves, and give a clear presentation about the results	The topic of study is interesting. The analysis is thorough and creative, with a research component. The presentation is clear.	The topic of study is interesting. The analysis is mostly thorough. The presentation is clear.	The topic of study is conventional, and the study does not require to take efforts. The analysis is superficial. The presentation is alright.	No presentation is given.
4. Exam	Whether students can answer all questions correctly.	Depending on the rubrics of the final exam paper	Depending on the rubrics of the final exam paper	Depending on the rubrics of the final exam paper	Score less than 30%, or fail to be present for the exam.

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.)

On-demand self-service and resource pooling; rapid elasticity; measured service; Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS); virtualization technologies: hypervisor and virtual machines, full vs paravirtualization; cloud storage architecture; data deduplication; cloud security issues: storage outsourcing versus storage auditing, data encryption versus computing over encrypted data, resource virtualization versus side channel or covert channel attacks; case studies of current cloud computing platforms: Azure, EC2.

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.	N.A.

2.2 Additional Readings

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

1.	*Guide to Cloud Computing: Principles and Practice*, Richard Hill, Laura Hirsch, Peter Lake and Siavash Moshiri, Springer, 2013.
2.	*Cloud Computing: Concepts, Technology & Architecture*, Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Prentice Hall, 2013.
3.	*Distributed and Cloud Computing: From Parallel Processing to the Internet of Things,* Kai Hwang, Jack Dongarra and Geoffrey C. Fox, Morgan Kaufmann, 2011.