City University of Hong Kong
Course Syllabus

offered by Department of Computer Science
with effect from Semester B 2018/19

Part I Course Overview

Course Title:	Cloud computing
Course Code:	CS4296
Course Duration:	One semester
Credit Units:	3 credits
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)*	CS3103 Operating Systems or CS3201 Computer Networks or CS4480 Data-Intensive Computing
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 enabling the students to acquire and explore the concepts and techniques of cloud computing. It also aims to examine the critical technology trends of cloud computing, in particular, the architecture and the design of existing deployments, the services and the applications that the clouding computing can offer, and the challenges that needs to be addressed to help cloud computing to reach its full potential.

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 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.	Identify the security issues in both private and public cloud computing systems and possible solutions.	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.)

Teaching pattern:

Suggested lecture/laboratory mix: 2 hrs. lecture; 1 hr. tutorial.

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lecture	Lectures will cover the essential concept, common platforms and core technologies in mobile application development.	✓	✓	✓	✓	✓	2
Tutorial	Tutorials will be in form of 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 and widen students' exposure on the related topics and to creatively apply concepts learned to new scenarios.	✓	✓	✓	✓	✓	1
Programming assignment	The programming assignment will provide an opportunity for students to use software tools and programming interfaces in common cloud platforms to develop small functional programs to satisfy specific user requirements.				✓		1
Group project and presentation	The group project will test the students, 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: 40%							
Programming assignment				✓		20%	
Group project and presentation	✓	✓	✓		✓	20%	
Examination^: 60% (duration: 2 hours)							
** The weightings should add up to 100%.*						100%	

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

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. 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. Group project and presentation	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.
3. 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.

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.)

Characteristics of the cloud computing model: 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; Examples of current cloud computing platforms: e.g., Azure, EC2; cloud storage architecture; data deduplication; data parallel programming models in the cloud environment: MapReduce and Hadoop; cloud security issues: storage outsourcing vs. storage auditing, data encryption vs. computing over encrypted data, resource virtualization vs. covert channel attacks; evaluation of contemporary cloud services.

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.)

2.2 Additional Readings

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

1.	Jamsa, Kris A.Burlington, Jones & Bartlett Learning (2013). *Cloud computing: SaaS, PaaS, IaaS, virtualizatin, business models, mobile, security, and more*.
2.	Richard Hill, Laura Hirsch, Peter Lake and Siavash Moshiri, Springer (2013). *Guide to Cloud Computing: Principles and Practice*.
3.	Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Prentice Hall (2013). *Cloud Computing: Concepts, Technology & Architecture*.
4.	Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, Morgan Kaufmann (2013). *Mastering Cloud Computing: Foundations and Applications Programming.*