CS4296: CLOUD COMPUTING

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Cloud Computing

Subject Code
CS - Computer Science
Course Number
4296

Academic Unit
Computer Science (CS)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
CS3103 Operating Systems or
CS3201 Computer Networks or
CS4480 Data-Intensive Computing

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to enabling the students to acquire and explore the basic concepts and techniques of cloud computing. It also aims to introduce critical technology of cloud computing and its development trends. The course includes but not limited to the following topics: the architecture and design of existing deployments, the services and applications that clouding computing can offer, fundamental scheduling algorithms for service provisioning and virtualized resource sharing, and the challenges that needs to be addressed to help cloud computing to reach its full potential.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain basic concepts and underlying technologies of cloud computing applications including the essential characteristics and service models.	10	x	x	
2	Explain the underlying principles of different virtualization technologies, cluster scheduling and management, job scheduling, and fairness on resource sharing.	25		x	
3	Explain the underlying technologies of distributed systems in the cloud, for example distributed storage systems and datacentre networks and Quality of Service (QoS)-guaranteed service provisioning in datacenters to enable the cloud to deliver performance-guaranteed services for various applications.	25		x	
4	Apply cloud computing techniques and use relevant tools, such as Hadoop and Spark, for various real-world applications including big data analytics, and machine learning in the cloud environment, and utilize cloud management tools to provide resources provisioning and monitoring.	30	x	x	
5	Identify the security issues in both private and public cloud computing systems and possible solutions.	10		x	

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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Lectures will cover the essential concept and theories, principle, common platforms and core technologies in cloud computing.	1, 2, 3, 4, 5	3 hours/week
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, 2, 3, 4, 5	1 hour/week
3	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.	4	After class
4	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, 2, 3, 5	After class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Programming assignment	4	20	
2	Group project and presentation	1, 2, 3, 5	20	

Continuous Assessment (%)
40

Examination (%)
60

Examination Duration (Hours)
2

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

Assessment Rubrics (AR)

Assessment Task
Programming assignment

Criterion
Whether students can independently and correctly write Hadoop programs to solve the given data analytical tasks

Excellent (A+, A, A-)
The answer is correct. The code is independently written with clear structure.

Good (B+, B, B-)
The answer is mostly correct, with some mistakes. The code is independently written with clear structure.

Fair (C+, C, C-)
The answer is mostly incorrect. The code is independently written with clear structure.

Marginal (D)
The answer is wrong. The code is messy.

Failure (F)
No submission/meaningful solution presented in the submission.

Assessment Task
Group project and presentation

Criterion
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

Excellent (A+, A, A-)
The topic of study is interesting. The analysis is thorough and creative, with a research component. The presentation is clear.

Good (B+, B, B-)
The topic of study is interesting. The analysis is mostly thorough. The presentation is clear.

Fair (C+, C, C-)
The topic of study is conventional and does not require much study. The analysis is not interesting. The presentation is clear.

Marginal (D)
The topic of study is conventional and does not require much study. The analysis is not interesting. The presentation is not good.

Failure (F)
No presentation is given.

Assessment Task
Exam

Criterion
Whether students can answer all questions correctly

Excellent (A+, A, A-)
Depending on the rubrics of the final exam paper

Good (B+, B, B-)
Depending on the rubrics of the final exam paper

Fair (C+, C, C-)
Depending on the rubrics of the final exam paper

Marginal (D)
Depending on the rubrics of the final exam paper

Failure (F)
Score less than 30%, or fail to be present for the exam.

Part III Other Information

Keyword Syllabus
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.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
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.