Lingnan University

Course Syllabus

Course Title	:	Cloud Computing
Course Code	:	CDS3106
Recommended Study Year	:	Year 3
No. of Credits	:	3
Mode of Tuition	:	Sectional Approach
Class Contact Hours	:	3 hours per week
Category	:	Major Elective
Discipline	:	Nil
Prerequisite(s)	:	CDS2003 Data Structures and Object-oriented Programming
Co-requisite(s)	:	Nil
Exclusion(s)	:	Nil
Exemption Requirement(s)	:	Nil

Brief Course Description:

Cloud computing has become the backbone of modern IT infrastructure, enabling scalable, secure, and cost-effective solutions for businesses worldwide. This course introduces the fundamental concepts, architecture, and technologies of cloud computing. Students will explore how cloud services enable scalable, on-demand computing resources and transform modern IT infrastructure. Topics include cloud service models (IaaS, PaaS, SaaS), virtualization, containerization, distributed systems, and cloud storage. The course also covers deployment strategies, security considerations, cost optimization, and emerging trends such as serverless computing and edge computing. Through hands-on labs and projects, students will gain practical experience with leading cloud platforms (e.g., AWS, Azure, or Google Cloud), learning how to provision resources, manage workloads, and implement cloud-native applications.

Aims:

This course aims to:

1. Introduce students to the fundamental principles of cloud computing, including its architecture, service models, and deployment strategies.
2. Equip students with the technical knowledge and skills to manage and optimize cloud systems effectively.

3. Provide hands-on experience with leading cloud platforms and tools to develop scalable and reliable cloud-based solutions.
4. Prepare students to critically evaluate cloud solutions, considering factors such as cost, scalability, and security.
5. Foster the ability to address cloud computing challenges through innovative and technical approaches.

Learning Outcomes (LOs)

Upon successful completion of this course, students will be able to:

1. Explain the core concepts and models of cloud computing, including service models and deployment strategies. (PILO1)
2. Configure and utilize virtualization tools and cloud services to deploy and manage applications effectively. (PILO2)
3. Identify and address security, privacy, and compliance challenges in cloud computing. (PILO7)
4. Design and implement scalable, efficient, and cost-effective cloud-based solutions tailored to specific industry needs. (PILO2, PILO5)
5. Evaluate and optimize cloud solutions for performance, cost, and scalability. (PILO2, PILO6)

Indicative Contents:

Introduction to Cloud Computing

Overview of the evolution, characteristics, and benefits of cloud computing, service models, and deployment strategies.

Cloud Infrastructure and Virtualization

Exploration of virtualization technologies, containerization, and their role in enabling cloud computing, including hypervisors, virtual machines, and resource optimization.

Cloud Platforms and Core Services

Introduction to leading cloud platforms (e.g., AWS, Azure, Google Cloud) and their core services, including compute, storage, and networking.

Cloud Storage and Data Management

Examination of cloud storage types (e.g., block, object, file) and strategies for data transfer, integration, and management in distributed systems.

Cloud Security and Compliance

Discussion of identity and access management (IAM), data encryption, compliance standards, and strategies to mitigate security risks in cloud environments.

Cost Management and Optimization

Analysis of pricing models, budget control, cost-saving techniques, and tools for monitoring and optimizing cloud expenditures.

Emerging Trends in Cloud Computing

Exploration of serverless computing, edge computing, AI/machine learning in cloud environments, and other innovations shaping the future of cloud computing.

Applications and Case Studies

Real-world use cases of cloud computing in industries such as e-commerce, IoT, healthcare, and big data analytics, and practices in cloud solution design.

Teaching Methods:

This course employs a variety of teaching and learning activities, including lectures, hands-on laboratory sessions, assignments, and group projects. Lectures provide students with a solid theoretical foundation in cloud computing concepts, such as service models, deployment strategies, virtualization, and security considerations. Laboratory sessions focus on developing practical skills, allowing students to configure cloud platforms, deploy applications, and manage resources using leading tools. Assignments encourage students to apply theoretical knowledge to solve specific cloud computing challenges. The group project emphasizes teamwork and practical problem-solving, requiring students to collaboratively design and present scalable and efficient cloud-based solutions. These activities collectively enhance students' readiness for assessments, including the final examination.

Measurement of Learning Outcomes:

Assessment / **LOs**	Class Attendance and Participation	Assignments	Group Project and Presentation	Final Examination
	(10%)	(30%)	(30%)	(30%)
LO1	✓	✓		✓
LO2		✓		
LO3	✓	✓		✓

LO4			✓	
LO5			✓	✓

1. Class attendance and participation assess students' engagement in lectures and their understanding of key cloud computing concepts, such as service models and deployment strategies (LO1). It also reflects their ability to contribute to discussions on challenges like security and compliance (LO3).
2. Assignments progressively evaluate students' ability to apply cloud computing concepts and tools. These include configuring cloud platforms (LO2), analysing security and compliance issues (LO3), and evaluating architectures for cost and performance optimization (LO1).
3. The group project assesses students' ability to collaboratively design and implement a scalable cloud-based solution (LO4). The accompanying presentation evaluates their ability to justify design decisions and critically analyse the solution's effectiveness (LO5).
4. The final examination evaluates students' understanding of core cloud computing principles (LO1, LO3). It also tests their ability to solve practical problems and optimize cloud solutions for performance and cost (LO5).

Assessment:

Class Attendance and Participation	10%
Assignments	30%
Group Project and Presentation	30%
Final Examination	30%
Total	100%

Required/Essential Readings:

1. Erl, T., & Monroy, E. (2023). *Cloud Computing: Concepts, Technology, Security, and Architecture (2nd ed.)*. Pearson.
2. Ruparelia N. B. (2023). *Cloud Computing.* MIT Press.

Recommended/Supplementary Readings:

1. Song, L. (2023). *The Self-Taught Cloud Computing Engineer: A comprehensive professional study guide to AWS, Azure, and GCP.* Packet Publishing.
2. Buyya, R., Vecchiola, C., & Selvi, S. T. (2013). *Mastering Cloud Computing: Foundations and Applications Programming*. Morgan Kaufmann.

3. Krutz, R. L., & Vines, R. D. (2010). *Cloud Security: A Comprehensive Guide to Secure Cloud Computing*. Wiley.
4. Hwang, K., & Dongarra, J., & Fox, G. (2011). *Distributed and Cloud Computing: From Parallel Processing to the Internet of Things*. Morgan Kaufmann.
5. Official documentation from AWS, Microsoft Azure, and Google Cloud.

Important Notes:

(1) Students are expected to spend a total of 9 hours (i.e. 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.
(2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examinations and Course Work. In particular, plagiarism, being a kind of dishonest practice, is "the presentation of another person's work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student's own work". Students are required to strictly follow university regulations governing academic integrity and honesty.
(3) Students are required to submit writing assignment(s) using Turnitin.
(4) To enhance students' understanding of plagiarism, a mini-course "Online Tutorial on Plagiarism Awareness" is available on http://pla.ln.edu.hk/.

Students must adhere to the University's guidelines and practices when using Generative Artificial Intelligence (GAI) tools. The official documents "Guidelines for Using GAI Tools at Lingnan University" and "Best Practices for Ethical and Responsible Use of GAI Tools in Course Assessments" can be found here: https://www.ln.edu.hk/tlc/generative-artificial-intelligence/gai-guidelines-best-practices.

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Course Rubrics

Rubric for Class Attendance and Participation (10%)

Criterion	Excellent (90-100)	Good (70-89)	Pass (50-69)	Fail (0-49)
Class Attendance (50%)	Attends over 90% of all scheduled classes, including lectures and laboratory sessions.	Attends at least 70% but less than 90% of all scheduled classes.	Attends at least 50% but less than 70% of all scheduled classes.	Attends less than 50% of all scheduled classes.
Class Participation (50%)	Actively and consistently participates in class activities, discussions, and laboratory exercises; demonstrates strong engagement, preparedness, and constructive contribution.	Participates regularly in class activities and discussions; demonstrates adequate preparation and engagement.	Participates occasionally in class activities with limited engagement or preparation.	Rarely or never participates in class activities; shows minimal engagement or preparation.

Rubric for Assignments (30%)

Criterion	Excellent (85-100)	Good (70-84)	Pass (50-69)	Fail (0-49)
Functional Completeness (40%)	All required features and tasks are implemented and fully functional, demonstrating mastery of cloud platform configuration and tools.	Most required features and tasks are functional, with minor bugs or missing elements.	Minimum functional requirements are met, but with frequent errors or instability.	Features and tasks are largely incomplete or non-functional.
Application of Cloud Concepts (30%)	Demonstrates a thorough application of cloud computing concepts, such as service models, deployment strategies, or other relevant topics from the course.	Applies cloud computing concepts effectively, with minor gaps or incomplete understanding.	Applies basic cloud computing concepts but shows limited understanding or depth.	Fails to apply cloud computing concepts effectively or demonstrates poor understanding.

Problem-Solving and Analysis (30%)	Effectively analyses and solves assignment problems, integrating relevant techniques and tools to produce clear, logical solutions.	Solves most problems effectively, with minor inaccuracies or incomplete analysis.	Solves basic problems but with limited analysis or inconsistent approaches.	Fails to solve problems or provides poorly structured, unclear, or incorrect solutions.

Rubric for Group Project and Presentation (30%)

Criterion	Excellent (85-100)	Good (70-84)	Pass (50-69)	Fail (0-49)
Solution Design and Implementation (40%)	Proposes and implements a highly scalable, efficient, and innovative cloud-based solution, meeting all requirements.	Proposes and implements a functional solution that meets most requirements, with minor deficiencies.	Provides a basic solution with limited scalability, efficiency, or innovation.	Solution is incomplete or fails to meet key requirements.

Critical Analysis and Justification (30%)	Provides a thorough and well-supported analysis of the solution's effectiveness, identifying strengths and areas for improvement.	Provides an adequate analysis and justification of the solution, with minor gaps or omissions.	Provides a basic analysis and justification, with limited depth or critical insights.	Fails to critically analyse or justify the solution effectively.
Presentation Performance (Students' individual contributions will be assessed) (30%)	Delivers a highly engaging, professional presentation with clear visuals and confident communication, effectively explaining design decisions.	Delivers a clear presentation with adequate visuals and communication, with minor gaps in clarity or delivery.	Provides a basic presentation with limited structure, unclear visuals, or minimal confidence.	Presentation is poorly structured, unclear, or fails to explain key points effectively.

Rubric for Final Examination (30%)

Criterion	Excellent (85-100)	Good (70-84)	Pass (50-69)	Fail (0-49)
Core Conceptual Understanding (50%)	Demonstrates deep and accurate understanding of cloud computing concepts, including service models, deployment strategies, and security challenges.	Demonstrates good understanding, with minor inaccuracies or incomplete explanations.	Demonstrates basic understanding, with noticeable gaps or lack of depth.	Demonstrates poor understanding, with significant inaccuracies or incomplete explanations.
Problem-Solving and Optimization (50%)	Solves practical cloud computing problems using advanced techniques, providing logical, well-optimized solutions.	Solves practical cloud computing problems using advanced techniques, providing logical, well-optimized solutions.	Solves basic problems, but solutions may lack consistency or optimization.	Solves basic problems, but solutions may lack consistency or optimization.