Uka Tarsadia University

B.Tech.

Semester IV

INTRODUCTION TO CLOUD COMPUTING

IT4022

Effective From July-2022

Syllabus version: 1.00

Subject Code	Subject Title	Teaching Scheme			
		Hours		Credits	
		Theory	Practical	Theory	Practical
IT4022	Introduction to Cloud Computing	3	2	3	1

Subject Code	Subject Title	Theory Examination Marks		Practical Examination Marks	Total Marks
		Internal	External	CIE	
IT4022	Introduction to Cloud Computing	40	60	50	150

Objectives of the course:

- To acquaint conceptual aspect of cloud computing, its enabling technology, security and privacy concerns, data management and commercialisation.

Course Outcomes:

Upon completion of the course, the student will be able to,

CO1: Define cloud computing, its architecture and various computing paradigm.

CO2: Analyse various cloud deployment models along with the management of cloud resource and data.

CO3: Understand the basics of cloud service models, programming models available in cloud, software development.

CO4: Understand basics of virtualisation, hypervisors, data centre environment and its networking issues.

CO5: Understand the security issues, identity management and access control.

CO6: Describe various cloud applications, features provided by cloud vendors and future trends.

Sr. No.	Topics	Hours
	Unit – I	
1	**Cloud computing Fundamentals:** Motivation for cloud computing, NIST definition of cloud computing, 5-4-3 principles of cloud computing, cloud ecosystem, Requirements for cloud services, Benefits and drawbacks, Computing paradigms, The cloud reference model: Architecture, Anatomy of the cloud.	6
	Unit – II	

2	**Cloud Deployment Models and Data Management:** Introduction, Private cloud, Public cloud, Community cloud, Hybrid cloud, Network connectivity in cloud computing, Managing the cloud, Declaring data types, Securing data, Data location, Data control, Securing data for transport, Looking at data, scalability, and cloud services, Metadata, Data handling from cloud vendors.	8
Unit – III		
3	**Cloud Service Model and Software Development:** Introduction, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Other cloud service models, Application on the cloud, Migrating application to cloud, Introduction of programming models for cloud, Extended programming models for cloud, Introduction of software development in cloud, Perspectives on SaaS development, cloud-aware software development using PaaS.	9
Unit – IV		
4	**Virtualization and Networking in Cloud:** Introduction, Characteristics of virtualized environments, Virtualization opportunities, Approaches to virtualization, Hypervisors and its role, Types of virtualization, Pros and cons of virtualization, Technology examples: Xen, VMware, Microsoft Hyper-V, Networking: Introduction to networking in cloud, Overview of data centre environment, Networking issues in data centres, Transport Layer Issues in DCNs.	8
Unit – V		
5	**Security and Privacy in Cloud computing:** Introduction: Cloud in IT, Security aspects, Cloud security design principles, NIST 33 security principles, Platform related security, Audit and compliance, Reducing cloud security breaches, Virtualization security management, Identity management and access control.	8
Unit – VI		
6	**Industrial Platforms and New Developments:** Cloud platforms in industry: Amazon Web Services, Google AppEngine, Microsoft Azure, Cloud application: Scientific application, Business and Consumer application, Advanced topics: Energy efficiency in cloud, Market based management of cloud, Federated cloud, Third party cloud services.	6

Sr. No.	Introduction to Cloud Computing (Practical)	Hours
1	Study various cloud application from domains like retail, education, finance, scientific, business etc.	2
2	Study various cloud service providers and prepare a comparative study for services, pricing model, domains of application, availability etc.	2

3	a) Prepare an analysis on correlation between types of hypervisor and virtualisation. b) Prepare a step-wise report on establishing prototype model of data centre.	2
4	Setting up a cloud computing environment: Students can set up a cloud computing environment using a cloud service provider (e.g., AWS, Azure, Google Cloud) and perform various tasks such as creating virtual machines, configuring networking, and setting up storage.	2
5	Cloud storage and databases: Students can use cloud storage and databases (e.g. Amazon S3, Google Cloud Storage, AWS DynamoDB) to store and manage data, and integrate them into their web applications.	2
6	Building a web application: Students can build a simple web application using a Platform as a Service (PaaS) provider and deploy it to the cloud.	2
7	Cloud security and privacy: Students can learn about various security and privacy issues in cloud computing and perform tasks such as setting up firewalls, securing virtual machines, and encrypting data at rest.	4
8	Cost optimization in the cloud: Students can learn about cost optimization in the cloud and perform tasks such as monitoring cloud resource usage, managing cloud costs, and optimizing cloud resource utilization.	4
9	Serverless computing: Students can learn about serverless computing and use a serverless computing platform such as AWS Lambda or Azure Functions to build and deploy a simple application.	4
10	Setting up a small data centre in the laboratory with real devices using hypervisor.	6

Text book:

1. K. Chandrasekaran - “Essentials of Cloud computing”, 2015, Taylor & Francis Group, LLC.

Reference books:

1. J. Hurwitz, R. Bloor, M. Kaufman, and Dr. F. Halper - “Cloud computing for Dummies”, 2010, Wiley Publishing, Inc
2. R. Buyya, C. Vecchiola, S. T. Selvi - “Mastering Cloud computing”, 2013, Elsevier Inc.
3. R. L. Krutz, R. D. Vines - “Cloud Security”, 2010, Wiley Publishing, Inc.
4. T. Erl, Z. Mahmood, R. Puttini - “Cloud computing: Concepts, Technology & Achitecture”, 2013 Arcitura Education Inc.

Course objectives and Course outcomes mapping:

- To acquaint conceptual aspect of cloud computing, its enabling technology, security and privacy concerns, data management and commercialisation: CO1, CO2, CO3, CO4, CO5, CO6

Course units and Course outcome mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Cloud computing Fundamentals	✓					
2	Cloud Deployment Models and Data Management		✓				
3	Cloud Service Model and Software Development			✓			
4	Virtualization and Networking in Cloud				✓		
5	Security and Privacy in Cloud computing					✓	
6	Industrial Platforms and New Developments						✓

Programme Outcomes:

PO 1: Engineering knowledge: An ability to apply knowledge of mathematics, science, and engineering.

PO 2: Problem analysis: An ability to identify, formulates, and solves engineering problems.

PO 3: Design/development of solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints.

PO 4: Conduct investigations of complex problems: An ability to use the techniques, skills, and modern engineering tools necessary for solving engineering problems.

PO 5: Modern tool usage: The broad education and understanding of new engineering techniques necessary to solve engineering problems.

PO 6: The engineer and society: Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.

PO 7: Environment and sustainability: Articulate a comprehensive world view that integrates diverse approaches to sustainability.

PO 8: Ethics: Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.

PO 9: Individual and team work: An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions.

PO 11: Project management and finance: An ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: A recognition of the need for, and an ability to engage in life-long learning.

Programme Outcomes and Course Outcomes mapping:

Programme Outcomes	Course Outcomes					
	CO1	CO2	CO3	CO4	CO5	CO6
PO1	✓	✓	✓	✓	✓	✓
PO2		✓	✓	✓		
PO3						
PO4		✓	✓	✓	✓	
PO5	✓	✓	✓	✓	✓	✓
PO6						
PO7				✓		
PO8						
PO9						
PO10						
PO11						
PO12						