

# UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE

SYLLABUS WITH EFFECT FROM 2023-2024

**Year: III**

**Semester: VI**

<b>Cloud Computing</b>	<b>325E6D</b>
Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	
<b>Credits 3</b>	<b>Lecture Hours:5 per week</b>
<p><b>Learning Objectives:</b> (for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> <li>• To impart fundamental concepts of Cloud Computing.</li> <li>• To impart a working knowledge of the various cloud service types and their uses and pitfalls.</li> <li>• To enable the students to know the common features and differences in the service offerings of the three major Cloud Computing service providers, namely Amazon, Microsoft and Google.</li> <li>• To provide know-how of the various aspects of application design, benchmarking and security on the Cloud.</li> </ul>	
<p><b>Course Outcomes:</b> (for students: To know what they are going to learn)</p> <p>CO1: To understand the concepts and technologies involved in Cloud Computing.</p> <p>CO2: To understand the concepts of various cloud services and their implementation in the Amazon, Microsoft and Google cloud computing platforms.</p> <p>CO3: To understand the aspects of application design for the Cloud.</p> <p>CO4: To understand the concepts involved in benchmarking and security on the Cloud.</p> <p>CO5: To understand the way in which the cloud is used in various domains.</p>	

Units	Contents
<b>I</b>	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.
<b>II</b>	Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines. Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation Identity and Access Management Services: Amazon Identity and Access Management

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	- Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack
<b>III</b>	Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).
<b>IV</b>	Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.
<b>V</b>	Case Studies: Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.

### Learning Resources:

#### Recommended Texts

1. Arshdeep Bahga, Vijay Madiseti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018.

#### Reference Books

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
3. David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2012.
4. Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.