CLOUD COMPUTING

Course Code	**23CS3602**	**Year**	III	**Semester**	II
Course Category	**Professional Core**	**Branch**	**CSE**	**Course Type**	Theory
Credits	3	**L – T – P**	3-0-0	**Prerequisites**	Fundamentals of CN, Basics of OS, Programming & Web Technologies (Basic Level)
Continuous Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	**Understand** fundamental cloud computing concepts, service models, deployment models, security challenges in the cloud ecosystem.	L2
CO2	**Apply** distributed and parallel computing paradigms in cloud environments.	L3
CO3	**Apply** virtualization and container technologies, federated cloud for cloud resource provisioning and application deployment.	L3
CO4	**Apply** serverless computing, edge/fog computing, and infrastructure-as-code to design and deploy scalable cloud-based applications.	L3

Syllabus		
Unit No.	**CONTENTS**	**Mapped CO**
I	**Introduction to Cloud Computing Fundamentals** Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google AppEngine).	**CO1**
II	**Cloud Enabling Technologies** Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.	**CO1,CO2**
III	**Virtualization and Containers** Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.	**CO1,CO3**

IV	**Cloud computing challenges** Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.	**CO1,CO3**
V	**Advanced concepts in cloud computing** Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.	**CO1,CO4**

Learning Resources
Text Books
1. Mastering Cloud Computing, 2nd edition, Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, Mc Graw Hill, 2024. 2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012
Reference Books
1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018. 2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014. 3. Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)
E-Resources & Other Digital Material
• **Prof. Rajkumar Buyya. Cloud Computing – NPTEL Online Course.** Indian Institute of Technology Madras. Retrieved from https://nptel.ac.in/courses/106105167
• **University of Illinois. Cloud Computing Specialization – Coursera.** Covers virtualization, cloud architecture, cloud storage, distributed systems. Retrieved from https://www.coursera.org/specializations/cloud-computing
• **Linux Foundation. Introduction to Cloud Computing – edXCourse.** **Beginner-friendly course on cloud models, virtualization, containers.** **Retrieved from https://www.edx.org/learn/cloud-computing/introduction-to-cloud-computing**
• **Stanford University. CS349D Cloud Computing – Lecture Notes (Open Access).** **Cloud architecture, distributed systems, cloud storage.** **Retrieved from https://web.stanford.edu/class/cs349d/**

- **Microsoft Learn. Azure Cloud Fundamentals.**
  Hands-on modules for cloud services, VM provisioning, functions, serverless.
  Retrieved from
  https://learn.microsoft.com/en-us/training/paths/az-900-describe-cloud-concepts/

- **Google Cloud Skills Boost. Cloud Computing Basics.**
  Labs on cloud infrastructure, Kubernetes, serverless (Cloud Functions).
  Retrieved from https://www.cloudskillsboost.google/

- **AWS Training & Certification. AWS Cloud Practitioner Essentials.**
  Cloud models, EC2, S3, IAM, serverless, containers.
- **Retrieved from https://aws.amazon.com/training/digital/aws-cloud-practitioner-essentials/**

- **GeeksforGeeks. Cloud Computing Tutorials.**
  Covers cloud models, virtualization, distributed systems, serverless. Retrieved from https://www.geeksforgeeks.org/cloud-computing/

- **TutorialsPoint. Cloud Computing Basics.**
  Simplified theory: IaaS, PaaS, SaaS, virtualization, MapReduce, cloud storage. Retrieved from https://www.tutorialspoint.com/cloud_computing/index.htm