CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF TECHNOLOGY & ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CS451: ADVANCED COMPUTING TECHNOLOGY

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

Pre-requisite courses:

- Operating System
- Networking

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Computing Technology	08
2.	Cloud Enabling Technologies	08
3.	Cloud Architectures	08
4.	Edge Computing & its Applications	06
5.	Fog Computing & its Applications	06
6.	Container Technology & Tools	06
7.	Market Place of Advanced Computing Platforms	03
	Total hours (Theory) :	45
	Total hours (Lab) :	30
	Total hours :	75

Detailed Syllabus:

1	**Introduction to Computing Technology**	**08 Hours**

	Overview of Cluster Computing, Grid Computing Systems, Cloud Computing, Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models, Desired Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Challenges and Risks in Cloud Computing.	
2	**Cloud Enabling Technologies** Data Center Technology, Virtualization Technology, Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Managing Virtualization Environment, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Centre Automation.	**08 Hours**
3	**Cloud Architectures** Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture, Hypervisor Clustering Architecture, Load Balanced Virtual Server Instances Architecture.	**08 Hours**
4	**Edge Computing & its Applications** Edge computing purpose and definition, Benefits of Edge Computing, Different Types of Edge, Edge Deployment Modes, Edge computing hardware architectures (Gateway), Edge Computing Use-Cases, Edge Computing Marketplace.	**06 Hours**
5	**Fog Computing & its Applications** Introduction to Fog Computing: Fog Computing, Characteristics, Application Scenarios, Issues and challenges. Fog Computing Architecture: Communication and Network Model, Programming Models, Fog Architecture for smart cities, healthcare and vehicles.	**06 Hours**
6	**Container Technology & Tools** Understanding Basic Terms: Cgroups, Namespace, Layered File System etc., Understanding & Implementing Container, Virtual Machine vs Containers, Pros and Cons of Container Technology, Fundamentals of Docker, Docker networking and storage, Docker Compose, Introduction to Container Orchestration and Tool: Kubernets	**06 Hours**

7	**Market Place of Advanced Computing Platforms** Study of Futuristic computing: Amazon Web Services, Microsoft Azure Services, Google Cloud Platform, Salesforce Enterprise Cloud Services.	**03 Hours**

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	Assess and examine advantages and disadvantages of cloud computing and virtualization technology.
CO2	Compose services in a distributed computing environment to achieve tasks relevant to a knowledge-based business or public service
CO3	Evaluate a set of business requirements to determine suitability for a cloud computing delivery model.
CO4	Explore the various cloud computing architectures and paradigms.
CO5	Deployment of cloud and identify security implications in cloud computing.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	-	2	-	-	-	2	2	-
CO2	3	2	3	2	3	2	2	-	-	-	2	2	2	2
CO3	3	2	2	3	3	2	2	-	2	2	-	-	2	2
CO4	3	2	2	2	2	-	-	2	2	-	-	-	2	2
CO5	3	2	3	2	3	2	2	2	-	2	-	2	2	2

Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)If there is no correlation, put "-"

Recommended Study Material:

- Text Books:

1. Thomas Erl, Zaigham Mahmood,and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", Prentice Hall
2. Kai Hwang, Geoffrey C.,"Distributed and Cloud Computing", Morgan Kaufmann is an imprint of Elsevier
3. Navin Sabharwal, Ravi Shankar "Apache CloudStack Cloud Computing" PACKT Publishing

4. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984

❖ **Reference Books**:

1. Ravi Shankar, Navin Sabharwa "Cloud Computing First Steps: Cloud Computing for Beginners" Create Space Independent Publishing Platform
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski "Cloud Computing: Principles and Paradigms" Wiley
3. Judith Hurwitz, Robin Bloor "Cloud Computing For Dummies" , for Dummies
4. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806
5. David Jensen, "Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE

❖ **Web material:**

1. http://www.console.cloud.google.com
2. http://www.qwicklabscom
3. http://codelabs.developers.google.com
4. http://www.docker.com

❖ **Software/Platform:**

1. NetBeans
2. Eclipse
3. .NET
4. Google Cloud Platform
5. Amazon Web services
6. Microsoft Azure Platform