

FACULTY OF COMPUTER APPLICATIONS BCA (Hons) Cloud Computing

- **Sem.** :7
- **Subject Code** :05BH0705
- **Subject** : **Edge / Fog Computing**
- **Course Objectives** :
 1. *Students will be able to* understand the fundamentals of Edge and Fog Computing, their architectures, and key differences from cloud computing.
 2. *Students will be able to* analyze challenges such as resource federation, network slicing, and workload orchestration in Edge, Fog, and 5G environments.
 3. *Students will be able to* apply knowledge of middleware roles, service orchestration, and load balancing to optimize edge computing performance.
 4. *Students will be able to* evaluate security aspects such as data privacy, real-time processing, and AI-driven analytics to enhance secure edge environments.
 5. *Students will be able to* design and implement IoT solutions, AI integration, and security mechanisms in real-world Edge and Fog computing applications.
- **Prerequisites:**

Unit No	Topics Covered	No of lectures required
1	Introduction to Fog and Edge Computing 1.1 Understanding the Paradigm Shift: Evolution from Cloud to Fog & Edge Computing, Differences: Cloud vs. Fog vs. Edge ,Benefits of Edge & Fog Computing: Latency Reduction, Scalability, Real-time Processing ,Application Scenarios: Smart Cities, Autonomous Vehicles 1.2 Edge and Fog Computing Architecture Layers of Edge & Fog Computing, Key Components: Edge Nodes, Gateways, Fog Servers, Cloud Integration, Relationship Between Edge, Fog, and Cloud, Communication & Data Flow in Edge and Fog Environments	10
2	Challenges in Federating Edge Resources	10

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	<p>Overview of Networking and Management Challenges in a Federated Edge Environment</p> <p>2.1 The Networking Challenge</p> <p>Understanding Networking Challenges in a Federated Edge Environment ,A Service-Centric Model ,Reliability and Service Mobility ,Multiple Administrative Domains</p> <p>2.2 Addressing the Networking Challenge</p> <p>Strategies to Overcome Networking Issues, Innovative Solutions and Best Practices</p> <p>2.3. The Management Challenge</p> <p>Discovering Edge Resources, Deploying Services and Applications ,Migrating Services Across the Edge ,Load Balancing</p>	
3	<p>Network Slicing in 5G and Edge/Fog Computing</p> <p>3.1 Background Technologies</p> <p>High-Speed, Low-Latency Communication, Support for IoT and Ultra-Reliable Applications, Centralized Computing Model, Scalability and On-Demand Resource Allocation, Mobile Edge Computing (MEC) , Edge and Fog Computing ,Key Differences and Use Cases , Role in Decentralized Data Processing</p> <p>3.2 Introduction to Network Slicing</p> <p>Definition and Importance of Network Slicing ,Role in Modern Network Architectures , Benefits: Efficiency, Flexibility, and Customization</p>	10
4	<p>Fog Data Management</p> <p>4.1 Introduction to Fog Data Management</p> <p>Definition and Importance of Fog Data Management ,Role in Distributed Computing Environments ,Benefits: Low Latency, Efficient Resource Utilization, and Scalability</p> <p>4.2 Fog Data Life Cycle</p> <p>Data Acquisition- Methods and Sources of Data Collection , Lightweight Processing -Pre-Processing for Quick Decision-Making , Processing and Analysis -Data Aggregation and Computational</p>	10

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Text Book :

1. **Fog and Edge Computing Principles and Paradigms , Rajkumar Buyya and Satish Narayana Srirama , Wiley**

Reference Books :

1. **Edge Computing: A Primer – Mahadev Satyanarayanan, Springer**
2. **Edge and Fog Computing: Advances, Challenges, and Opportunities – Rajiv Ranjan, Boualem Benatallah, Schahram Dustdar, Cambridge University Press**
3. **Edge Computing: From Hype to Reality – Victor C. M. Leung, Min Chen, Laurence T. Yang, Springer**

Web References :

1. <https://www.econsortium.org>
2. <https://www.iiconsortium.org>

App References :

1. **Edge AI**
2. **AWS IoT Greengrass**

Syllabus Coverage from text /reference book & web/app reference:

Unit #	Chapter Numbers
1	Chapter 1
2	Chapter 2
3	Chapter 4
4	Chapter 8 - 8.1 to 8.2
5	Chapter 8 -8.3