

Fog & Edge Computing

Code: CS32227CS	Course Type: Elective	Semester: II
Evolution Scheme (TA-MSE-ESE): 20-30-100	Total Marks: 150	L-T-P (Credits): 3-0-0 (3)

Pre-Requisites: Computer Networks, Cloud Computing, IoT

Course Objective: To enable students to understand and apply fog and edge computing paradigms for efficient, secure, and low-latency IoT and real-time applications.

Course Outcomes: At the end of the course, the student will be able to

CO-1	Understand the basic requirements and challenges of fog and edge computing
CO-2	Understand the key architectures and Resource Management in fog and edge
CO-3	Demonstrate Middleware usage and Data Management in Edge-Cloud Architectures
CO-4	Apply Integrating fog, edge, and cloud infrastructures with ML Models

Course Articulation Matrix:

PO	PEO-1	PEO-2	PEO-3	PEO-4	PEO-5
CO-1	3	2	1	-	-
CO-2	3	2	1	-	1
CO-3	3	2	-	-	3
CO-4	3	2	1	1	-
CO-2	2	1	2	3	2

1 - Slightly; 2 - Moderately; 3 - Substantially

Syllabus:

Unit-1: *Introduction to Fog Computing* – Relevant Technologies, Fog and Edge Computing Completing the Cloud, Hierarchy of Fog and Edge Computing, Business Models, Opportunities and Challenges. *Addressing the Challenges in Federating Edge Resources* - The Networking Challenge, The Management Challenge, Miscellaneous Challenges.

Unit-2: *Integrating IoT + Fog + Cloud Infrastructures* - System Modeling and Research Challenges, Methodology, Integrated C2F2T Literature by Modeling Technique, Integrated C2F2T Literature by Use-Case Scenarios, Integrated C2F2T Literature by Metrics, Future Research Directions. *Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds* - 5G, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slicing Management in Edge and Fog.

Unit-3: *Optimization Problems in Fog and Edge Computing* – Preliminaries, The Case for Optimization in Fog Computing, Optimization Opportunities along the Fog Architecture, Optimization Opportunities along the Service Life Cycle. *Middleware for Fog and Edge Computing: Design Issues* - Need for Fog and Edge Computing Middleware, Design Goals, State-of-the-Art Middleware Infrastructures, System Model, Architecture examples, Future Research Directions.

Unit-4: *A Lightweight Container Middleware for Edge Cloud Architectures* - Clusters for Lightweight Edge Clouds, Architecture Management – Storage and Orchestration, IoT Integration, Security Management for Edge Cloud Architectures. *Data Management in Fog Computing* - Fog Data Management, *Predictive Analysis to Support Fog Application Deployment* - Predictive Analysis with FogTorchII, *Using Machine Learning for Protecting*

Learning Resources:

Text Books:

1. Fog and Edge Computing, Rajkumar Buyya, Satish Narayana Srirama, Wiley Publications, 2019.
2. Internet of Things - Architectures, Protocols and Standards, Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri, © 2019 JohnWiley & Sons Ltd.
1. Fog/Edge Computing for Security, Privacy and Applications, Wei Change and Jie Wu, Springer, 2021.