Course Title	Fundamentals of Distributed Systems with Cloud computing				
Course Code	CSE315				
Course Type	Elective				
Level	Bachelor (1st Cycle)				
Year / Semester	4th Year / 8th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	3 hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	This course studies the key design principles of distributed systems, which are collections of independent networked computers that function as single coherent systems. It covers fundamental concepts of distributed systems including network architectures, communication protocols, processes and threads and naming. It covers important paradigms in distributed systems, including logical clocks, distributed mutual exclusion; consistency, replication, fault tolerance, coordination and agreement and security. It addresses failures and fault-tolerance techniques in diverse applications, such as consensus, transactions, replicated data management, and self-stabilization. The Cloud Computing paradigm is introduced with its fundamentals principles, requirements, benefits, applications and challenges.				
Learning Outcomes	Upon successful completion of the course, students will be able to: • Explain and discuss the principles and theoretical models used in designing distributed systems. • Describe the trade-offs which must be made when designing a distributed system. • Describe and evaluate algorithms and architectural models used in implementing distributed file systems, logical clocks, elections, mutual exclusion, multicast message ordering, transactions, replication and peer-to-peer networks in distributed systems. • Explain the core concepts of Cloud Computing, characteristics, benefits, challenges, applications, • Apply the fundamental concepts of Cloud computing to evaluate trade-offs between different Cloud Computing solutions				

Prerequisites	CSE300	Co-requisites	None
Course Content	Course Contents: Fundamentals: definition of a distributed system, properties of distributed systems (distribution transparency, openness), scalability, types of distributed systems. architectures of distributed systems. processes, threads, virtualization, clients, servers, code migration. Communication: layered protocols, types of communication, remote procedure call, message-oriented communication, stream-oriented communication, multicast communication. Naming: names, identifiers, and addresses, flat and structured naming, attribute-based naming. Coordination: clock synchronization, physical clocks, global positioning system, clock synchronization algorithms, logical clocks, Lamport's logical clocks, vector clocks. mutual exclusion: centralized, decentralized, distributed algorithm, a token ring algorithms, comparison of them. Election algorithms: traditional election algorithms, elections in wireless environments, elections in large-scale systems. Consistency and replication: reasons for replication, data-centric consistency models, client-centric consistency models: eventual consistency, monotonic reads & writes. Replica management, consistency protocols. Fault tolerance: basic concepts, failure models, process resilience: failure masking and replication, agreement in faulty systems, failure detection. reliable client-server communication: point-to-point communication, reliable group communication: basic reliable-multicasting schemes, scalability in reliable multicasting, atomic multicast. Distributed commit, recovery. Security: introduction, secure channels, access control. Distributed object-based systems, distributed file systems, distributed web-based systems, distributed coordination-based systems: architecture, processes, communication, naming, synchronization, consistency and replication, fault tolerance. Introduction to Cloud Computing Cloud computing enabling technologies, infrastructures, virtualization in the cloud, software defined networks and storage, cloud storage,		

	cloud programming models, public infrastructures Amazon Web Services (AWS), Microsoft Azure,
Teaching Methodology	Face- to- face
Bibliography	A. Tannenbaum, M. van Steen, Distributed Systems: Principles and Paradigms, Prentice Hall. G. Coulouris, J. Dollimore, T. Kindberg, Distributed Systems: Concepts and Design, Addison-Wesley. T. Erl, Z. Mahmood, and R. Puttini. Cloud Computing: Concepts, Technology and Architecture, Pearson.
Assessment	Examinations 70% Assignments/Lab 20% Class Participation and Attendance 10% 100%
Language	English