

CLOUD AND EDGE COMPUTING IN THE INTERNET OF EVERYTING

GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	INFORMATICS AND COMPUTER ENGINEERING		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		SEMESTER	2 ^o
COURSE TITLE	CLOUD & EDGE COMPUTING IN THE INTERNET OF EVERYTING		
INDEPENDENT TEACHING ACTIVITIES <i>(In case credits are allocated to distinct parts of the course, e.g., Lectures, Laboratory Exercises, etc. If credits are allocated uniformly to the entire course, state the weekly teaching hours and total credits.)</i>		WEEKLY TEACHING HOURS	CREDITS
Lectures		3	8

COURSE CONTENT

The course includes the following teaching units:

- **Fundamental Concepts of Cloud Computing:** Definitions, key characteristics, supporting technologies, the NIST model, the cloud cube model, Delivery and service models, The concepts of IaaS, PaaS, and SaaS. The notions of private, public, community, and hybrid clouds, etc.
- **Virtualization – Computer Clusters – Network Infrastructures – Data Centers:** Definitions, core capabilities, types of virtualization, the concept of the hypervisor. Physical/virtual computer clusters, Requirements for organization and distribution, Integration and management at the data center level.
- **Middleware – Development Platforms:** What middleware is, related tools/development platforms, and their significance in developing cloud services. Representative implementations such as Nimbus, Eucalyptus, OpenNebula, CloudStack, OpenStack, etc.
- **Architectures – Design Issues:** Cloud reference model, Capacity planning, Resource provisioning, Auditing & monitoring. Workload distribution, Load balancing, Resource pooling, Load testing and resource ceilings, Dynamic scalability, Elasticity. Cloud serverless architecture, etc.
- **Programming Technologies – Development of Applications and Scientific Computing in the Cloud:** Available technologies, libraries, and frameworks for high-performance computing, interfaces/APIs, programming languages, and tools. Focus on distributed file systems and big data management (Hadoop/MapReduce & Spark).
- **Mobile Cloud Computing:** Specific requirements for developing, distributing, and scaling mobile applications in the cloud. The concept of cloudlets, Methods for migration and offloading in mobile cloud computing.
- **The Internet of Everything (IoE):** Architecture, main components (people, process, data, things), differences from IoT, the role of 5G network infrastructures, and other supporting technologies.
- **Cloud Support Requirements in IoE:** Infrastructure, development platforms, big data analysis, and management in IoE.
- **Fog Computing:** Architecture, key features, and requirements for implementing applications in IoE.
- **Edge Computing:** Architecture, communication protocols, programming tools, computation and data processing requirements, methods/models for distributing applications at the edge.
- **Modern Cutting-Edge Technologies Supporting Edge Computing Applications:** Virtualization, Software-Defined Networks, massive multi-core programming (GPU accelerators), etc.
- **Layered Application Development (cloud/fog/edge) in IoE:** Cloud computing applications/services for the end-user in IoE. Modern IoE applications in smart cities, healthcare monitoring, retail and logistics, connected cars, etc.
- **Optimization Techniques for Applications in IoE:** Addressing problems like shortest path

finding, maximum flow, and multi-criteria optimization – applied to recommendation systems, etc.

- **Other Issues:** Security requirements and mechanisms in cloud/fog/edge and IoE. High availability needs, The economics of Cloud Computing (cloudonomics). Moving an enterprise to the cloud (the 6 R's). Cost metrics/pricing models, Service quality metrics/SLAs, Institutional and legal issues.