Jimma University

Jimma Institute of Technology

Faculty of Computing and Informatics

Software Engineering Program

Course Title: Fundamentals of Cloud Computing & IoT

Course Code: SEng3072 Cr. Hr /ECTS: 3 Hr / 5 ECTS (2hr Lecture, 3hr Lab)
Year/Semester: V/I

Course Description

- ✓ The course is intended to introduce the fundamental concepts, architectures, and models of Cloud Computing including virtualization, storage, networking, and deployment models. It sets its focus on the manner by which cloud services enable scalable, flexible, and cost-effective solutions for software applications.

- ✓ The course also introduces students to the basics of the Internet of Things (IoT), such as IoT architectures, devices, sensors, communication protocols, and their integration into cloud platforms. It identifies how IoT and Cloud Computing together enable real-time data acquisition, processing, and intelligent decision-making in different spheres.

- ✓ Lab activities focus on hands-on practice of cloud deployment, virtual machine setup, and IoT device integration. Hands-on projects such as IoT device connection to the cloud, visualization of sensor data, and implementing standard security practices will be practiced by students. The labs facilitate conceptual understanding and provide hands-on exposure in building and hosting simple Cloud and IoT applications.

Learning Outcomes

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

- ✓ Understand the principles and architectures of Cloud Computing and IoT.
- ✓ Explore service models (IaaS, PaaS, SaaS) and deployment models (Public, Private, Hybrid).
- ✓ Learn IoT architecture, devices, protocols, and applications.
- ✓ Develop basic cloud-based applications and IoT solutions.
- ✓ Analyze security, privacy, and ethical issues in Cloud and IoT.
- ✓ Apply concepts in real-world scenarios through labs and mini-projects

Course Contents

Unit 1: Introduction to Cloud Computing

1.1. Definition and Evolution of Cloud Computing
1.2. Characteristics and Benefits of Cloud Computing
1.3. Challenges of Cloud Computing
1.4. Virtualization: Concepts, Layers, Tools, and Platforms
1.5. Cloud Applications in Business, AI, and Big Data
1.6. Emerging Trends: Edge AI, Digital Twins, 5G & IoT, Green Cloud Computing

Unit 2: Cloud Service and Deployment Models

2.1 Cloud Service Models: IaaS, PaaS, SaaS
2.2 Cloud Deployment Models: Public, Private, and Hybrid

Unit 3: Introduction to IoT

3.1 Definition, Evolution, and Scope of IoT
3.2 IoT Reference Architecture
3.3 IoT Devices, Sensors, and Actuators
3.4 IoT Protocols: MQTT, CoAP, HTTP, Zigbee, LoRaWAN
3.5 IoT Edge and Fog Computing
3.6 IoT Applications in Smart Cities, Healthcare, Agriculture, and Industry

Unit 4: IoT Data and Cloud Integration

4.1 IoT Data Collection and Processing
4.2 Cloud Platforms for IoT (AWS IoT Core, Azure IoT Hub, Google IoT Core)
4.3 Real-time Data Streaming and Analytics
4.4 Case Studies / Lab Work (e.g., Smart Home IoT → Cloud)

Unit 5: Security and Privacy in Cloud Computing

5.1 Security Issues in Cloud Computing
5.2 Privacy Concerns in Cloud Computing
5.3 Best Practices and Standards (ISO, NIST)

Summary of Teaching Learning Methods

✓ The teaching-learning methodology will be student-centered with appropriate guidance of instructor/s during the student's activities.

✓ There will be Lecture, Demonstrations, Reading assignments and Group Discussions

Assessment Methods:

- ✓ **Assignments/Quizzes** – 10%
- ✓ **Mini Project (IoT + Cloud integration)** – 20%
- ✓ **Midterm Exam** – 20%
- ✓ **Final Exam** – 50%

Textbooks and References:

1. Rajkumar Buyya et al., *Mastering Cloud Computing*, McGraw Hill.
2. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*.
3. Thomas Erl, *Cloud Computing: Concepts, Technology & Architecture*.
4. Online resources: AWS Academy, Microsoft Learn, Google Cloud Skills Boost.