

CIT : IOT and Smart City

Gandaki University

IV Year, II Sem

Program: Bachelor of Information Technology

Subject: IOT and Smart City

Course Code: CIT

Credit Hour: 2+1=3

Contact Hours: 45

Year: IV

Semester: II

Lab Type: Computer Lab

Lab Hours: 10

1 Course Objectives

Some of the key objectives of learning IOT and Smart City are:

1. Understand the basic concepts of IoT
2. Plan an IoT implementation
3. Manage security, privacy, and safety risks on IoT projects
4. Manage an IoT prototyping and development project throughout the development lifecycle.

Course Description

The Internet of things (IoT) is a term for the growing number of electronics that aren't traditional computing devices, but are connected to the internet to send data, receive instructions or both.

There's an incredibly broad range of things that fall under that umbrella: Internet-connected smart versions of traditional appliances like refrigerators and light bulbs, gadgets that could only exist in an internet-enabled world like Alexa-style digital assistants; internet-enabled sensors that are transforming factories, healthcare, transportation, distribution centers and farms.

The IoT brings the power of the internet, data processing and analytics to the real world of physical objects. For consumers, this means interacting with the global information network without the intermediary of a keyboard and screen; many of their everyday objects and appliances can take instructions from that network with minimal human intervention.

The IoT has an important application in smart cities. Smart City is about urban infrastructure management using smart devices. This course will enable the readers to realize the smart-city concepts. In addition to IOT, the readers will understand about the smart-city technologies like Building Information Modeling(BIM), Geographical Information System (GIS) and Artificial Intelligence(AI).

2 Course Outcomes

- This course will enrich the students with the fundamental concepts, technologies, and challenges related to IoT and how they contribute to the development of smart and sustainable cities.
- The course will motivate the readers to develop a creative design to transform their municipality to smart-city.

3 Course Content

3.1 Overview of Internet of Things (IoT) 4 Hrs.

1. Definition of Internet of Things (IoT)
2. Trends of IoT: History and Growth of the IoT industry. Industries being powered by IoT.
3. Fundamental components of IoT system
4. Applications of IoT

3.2 Sensors and Devices used in IoT 6 Hrs.

1. Overview of Sensors and Devices.
2. Internet of Things (IoT) Device Hardware
3. Scaling, Manufacturing and Shipping.
4. Gateways

3.3 Connectivity 4 Hrs.

1. Introduction to Connectivity.
2. Cellular connectivity for IoT.
3. Satellite connectivity for IoT.
4. WiFi/Bluetooth/LPWAN connectivity for IoT.

3.4 Data Processing **4 Hrs.**

1. Introduction to the Cloud.
2. Introduction to Internet of Things (IoT) Platform.
 - Organization Strategies to choose an IoT platform.
 - Types of Internet of Things (IoT) Platform
 - Needs to migrate to an Internet of Things (IoT) Platform.
3. EDGE Computing and FOG Computing
4. APIs to integrate IoT to custom application.

3.5 IoT Protocols and Machine Learning **9 Hrs.**

1. Overview of IoT Protocols.
2. Internet of Things (IoT) Protocols: Data Protocols
 - MQTT
 - CoAP
 - AMQP
 - M2M Communication Protocol
 - XMPP
3. Internet of Things (IoT) Protocols: Network Protocols
 - HTTP
 - LoRaWAN
 - Bluetooth
 - ZigBee
4. Machine Learning for IoT

3.6 User Interface and User Experience in IoT **2 Hrs.**

1. Introduction to UI/UX for IoT
2. Key considerations for UI/UX.
3. Recent trends in designing UI/UX for IoT.

3.7 Security and Privacy in IoT **4 Hrs.**

1. IoT security challenges and threats
2. Authentication and access control in IoT systems
3. Data privacy and compliance in smart cities
4. Security best practices for IoT deployments

3.8 IoT for Smart Cities**3 Hrs.**

1. Introduction to smart city.
2. Needs for smart cities transformation.
3. Roles of Internet of Things (IoT) in Smart Cities.
4. Case Studies of Smart City.

3.9 Other technologies in Smart City**3 Hrs.**

1. Building Information Modeling (BIM) and Geographical Information System (GIS) value for smart cities.
 - BIM Dimensions
 - Sustainability and Facility Management in BIM
 - BIM Lifecycle
 - Integrating BIM and GIS
2. Big Data
3. Case Study: Applications of Smart City.

3.10 Smart City Design**6 Hrs.**

1. Smart energy management and grid systems
2. Smart transportation and traffic management
3. Environmental monitoring and sustainability
4. Smart buildings and infrastructure
5. Citizen participation in smart city initiatives

4 Project based Learning

1. Students work on a hands-on project related to IoT and smart cities
2. Students will receive Guidance and supervision by the instructor for designing a smart-city concept for their municipality.
3. Regular progress reviews and feedback sessions with related stakeholders is essential for final report.
4. Final project presentation and demonstration is done by the student.