SMART NETWORK FOR SUSTAINABLE CITIES

Objective

Design a sustainable and efficient network for a smart city by integrating computer networking, web development, Python programming, AI, and digital tools.
The project will address the need for seamless communication, smart device management, and energy efficiency in urban environments.

Session 1: Understanding Network and Digital Infrastructure

Activities

1. **Study of Computer Networks**

   <> Task

   Students will research the need for computer networks in a smart city, focusing on their advantages, types of networks (LAN, WAN, etc.), and devices required for data communication. They will prepare a presentation on how a well-designed network enhances the efficiency of a smart city.

   <> Skills Practiced

   - ✦ Understanding networking terminologies.
   - ✦ Learning the advantages of computer networks in smart city applications.
   - ✦ Presenting technical concepts clearly.

2. **Data Communication and Protocols**

   <> Task

   Students will explore the components of a data communication system and various networking protocols (TCP/IP, HTTP, etc.). They will simulate a basic network setup using a network simulator to understand packet transmission and protocol handling.

   <> Skills Practiced

   - ✦ Understanding data communication systems and protocols.
   - ✦ Hands-on experience with network simulation tools.

Outcome for Session 1

- <> A presentation on computer networks and data communication.
- <> A simulated network setup demonstrating basic protocols.

Session 2: Web and App Development for Smart City Services

Activities

1. **Designing Web Pages for Smart City**

    <> Task

    Students will use HTML5 to create web pages for smart city services, such as waste management systems, eco-friendly transport options, and real-time data dashboards for energy usage. They will integrate multimedia elements (images, audio, and video) to enhance user engagement.

    <> Skills Practiced

    - ✦ Using HTML5 for structuring content (images, videos, links).
    - ✦ Understanding the importance of web interactivity and user interface design.
    - ✦ Embedding multimedia elements into web pages.

2. **Smart City App Development**

    <> Task

    Students will design a mobile app for smart city management. This app will allow users to monitor energy consumption, report issues, and access real-time data from city services.

    <> Skills Practiced

    - ✦ Introduction to app development platforms (e.g. MIT App Inventor).
    - ✦ Designing user interfaces and app functionalities.
    - ✦ Understanding the use of mobile apps in smart city management.

Outcome for Session 2

<> An interactive webpage showcasing smart city features.

<> A prototype of a smart city mobile app for monitoring and managing services.

Session 3: AI for Smart City Applications

Activities

1. **Artificial Intelligence for Smart Cities**

    <> Task

    Students will learn about the domains of AI and its real-life applications in smart cities, including automated traffic management, healthcare services, and smart homes. They will design a simple AI model using Python to predict traffic flow or optimise energy consumption in buildings.

- ❖ **Skills Practiced**
  - ✦ Understanding AI domains and their relevance to smart cities.
  - ✦ Developing basic AI models using Python.
  - ✦ Exploring machine learning for predictive analytics.

2. **Integration of IoT in Smart City Solutions**

- ❖ **Task**

  Students will explore the Internet of Things (IoT) and its role in creating smart cities. They will use sensors to collect data from the environment (e.g., air quality, temperature) and use Python to process and display the data on a web dashboard.

- ❖ **Skills Practiced**
  - ✦ Integrating sensors and IoT devices into the system.
  - ✦ Using Python for data processing and visualisation.
  - ✦ Understanding how IoT improves sustainability and efficiency in smart cities.

Outcome for Session 3

- ❖ A basic AI model for traffic management or energy optimisation.
- ❖ An IoT-based dashboard displaying real-time city data.

Final Deliverables

Tick (✓) the box if submitted:

- ❖ Research presentation on computer networks and data communication.
- ❖ Web Pages for Smart City Services.
- ❖ Mobile App for Smart City Management.
- ❖ AI Model for Traffic Flow or Energy Optimisation.
- ❖ IoT Dashboard for Real-time Data Monitoring.
- ❖ Final Project Presentation showcasing the integrated system.

This capstone project empowers students to integrate core concepts of computer networks, web development, app creation, AI, and IoT to build a functional smart city solution, reflecting the technologies shaping urban futures.