

# CAPSTONE PROJECT

## SMART TRAFFIC SYSTEM SIMULATION AND DATA VISUALISATION

### Objective

Design and develop an interactive smart traffic system simulation that incorporates data analysis, visual presentations, and programming. The project will combine the use of Excel for data management, PowerPoint for presenting results, MakeCode Arcade for creating a simulation of a traffic light system, and Python for automating the system and interacting with the user.

### Session 1: Data Management and Visualization with Excel

#### Activities

##### 1. Entering Formulas and Functions in Excel

###### ✦ Task

- ✦ Students will input analyse traffic data using formulas and functions in Excel. This will include using cell referencing, understanding cell range, and applying functions to calculate traffic flow, traffic light timings, and average wait times.

###### ✦ Skills Practised

- ✦ Using different types of cells referencing
- ✦ Entering and applying formulas to analyse data
- ✦ Customizing worksheet tabs to make the data more accessible

##### 2. Creating Charts to Visualize Traffic Data

###### ✦ Task

- ✦ Students will use Excel's charting features to create visual representations of traffic flow, light timings, and wait times at different intersections in the smart city simulation.

###### ✦ Skills Practised

- ✦ Creating charts (bar, line, pie) to visualize data
- ✦ Sorting data to display trends and patterns
- ✦ Customizing the chart to represent the traffic system efficiently



## Outcome for Session 1

- ◊ A spreadsheet with formulas, functions, and charts to visualize traffic data.
- ◊ Traffic analysis report that summarizes key insights.

## Session 2: Presentation of Smart Traffic System in PowerPoint

### Activities

#### 1. Designing the Traffic System Presentation

##### ◊ Task

- ✦ Students will create an interactive PowerPoint presentation that explains how the smart traffic system works, using slide transitions, animations, and media clips. The slides will highlight how data from Excel is used to control traffic light timings and optimize traffic flow.

##### ◊ Skills Practised

- ✦ Using advanced PowerPoint features such as slide transitions, animations, and media clips
- ✦ Incorporating action buttons to create interactive slides
- ✦ Importing data from other applications (Excel) into PowerPoint to display results

#### 2. Creating an Animated Traffic Light System

##### ◊ Task

- ✦ Students will use PowerPoint animation to simulate the movement of traffic lights and vehicles, showcasing how the smart traffic system adapts to the traffic flow and adjusts timings dynamically.

##### ◊ Skills Practised

- ✦ Animating objects (traffic lights and vehicles) to simulate a working traffic system
- ✦ Customizing slide views to display different parts of the system
- ✦ Using action buttons to control traffic light cycles in the simulation

## Outcome for Session 2

- ◊ A dynamic PowerPoint presentation demonstrating the working of a smart traffic system, with interactive elements and animations.
- ◊ Animated traffic light simulation integrated into the presentation.



## Session 3: Creating the Traffic System Simulation with MakeCode Arcade and Python

### Activities

#### 1. Building a Traffic Light System Simulation with MakeCode Arcade

##### Task

- Students will use MakeCode Arcade to build a traffic light system simulation. They will apply block coding to create a basic traffic light program, involving sprites, background changes, and event handling.

##### Skills Practised

- Using MakeCode Arcade to create a sprite-based traffic light simulation
- Adding sprites (e.g., cars, traffic lights) and changing backgrounds to simulate the traffic system
- Understanding event handling and common blocks like on start, on button press, and forever loops

#### 2. Python Automation for Traffic System Control

##### Task

- Students will write a Python script to control the smart traffic system, based on user inputs. They will create variables to store traffic data (e.g., traffic light timings) and use input/output functions to interact with the user, adjusting the traffic light sequence based on the input data.

##### Skills Practised

- Installing Python and setting up the environment
- Writing Python code to manage traffic light timings and user interactions
- Using variables to store and process data for traffic control

### Outcome for Session 3

- A working traffic light simulation built using MakeCode Arcade.
- A Python script that automates the traffic light system based on user input and dynamically adjusts timings.

### Final Deliverables

Tick (✓) the box if submitted:

- Excel Spreadsheet with formulas, functions, and charts to analyse traffic data
- Interactive PowerPoint presentation demonstrating the smart traffic system with animations, media clips, and action buttons



◊ Traffic Light Simulation created using MakeCode Arcade and Python automation 

◊ Final Presentation showcasing the complete smart traffic system, with data analysis, presentation slides, and simulation 

This capstone project integrates concepts from Excel, PowerPoint, MakeCode Arcade, and Python to create a comprehensive smart traffic system simulation. Students will gain hands-on experience in data analysis, digital design, coding, and automation, all while working towards a sustainable, efficient, and interactive traffic management solution.

