PYTHON WORKSHOP: PLANNED CONTENT

1. Introduction to Python and Its Applications (5 min)

- Why Python? Importance in electronics, robotics, and innovation
- Real-world applications: Data analysis, computer vision, hardware interfacing, and AI

2. Setting Up the Python Environment (15 min)

- Installing Python (`3.12`) and setting up a code editor or an IDE. (VSCode, PyCharm)
- Virtual environments:
  - Using `venv` for environment management
  - Brief mention of **Anaconda** as an alternative (not covered in this session)
  - Creating, activating, and deactivating a virtual environment
- Installing libraries with `pip`
- Essential Bash commands for Python projects:
  - Navigating directories (`cd`, `ls`, `pwd`)
  - Creating and managing files/folders (`mkdir`, `rm`, `touch`)
- Introduction to Jupyter Notebooks
  - Used for interactive coding, documentation, and data visualization

3. Python Basics Crash Course (35 min)

- Core Syntax (25 min):
  - Variables and data types
  - Control structures: `if-else`, loops (`for`, `while`)
  - Functions and modular programming
- Data Structures (5 min):
  - Lists: creation, indexing, slicing, and operations
- Libraries Overview (5 min):
  - Introduction to `numpy`, `pandas`, `matplotlib`, `opencv`, `scikit-learn`, `pyserial`, `requests` (and `flask`, `paho.mqtt`)

4. Practical Applications (55 min)

- **Serial Communication with `pySerial` (20 min)**
  - Setting up a serial connection (e.g., with Arduino)
  - Sending and receiving data over serial
  - Parsing and displaying real-time data (like sensor readings)
- **Sending and Receiving HTTPS Requests with `requests` (10 min)**
  - Making GET and POST requests
  - Handling JSON responses
  - Accessing public APIs for data retrieval
  - Mention Flask: Flask can be used to create a web server to interact with APIs using the `requests` library, handling incoming HTTP requests and sending data to external services.
  - Mention MQTT: MQTT as an alternative protocol for lightweight messaging in IoT applications

- **Data Analysis & Visualization (10 min)**
    - Reading and cleaning CSV files with `pandas`
    - Basic data manipulation and filtering
    - Visualizing data with `matplotlib` (line plots, scatter plots, histograms)
- **Basic Image Processing with `OpenCV` (5 min)**
    - Reading and displaying images
    - Converting images to grayscale
- **Simple Machine Learning Demo with `scikit-learn` (5 min)**
    - Training a basic classifier (e.g., digit or shape classification)
    - Key concepts: train-test split, model fitting, making predictions

5. Final Q&A and Next Steps (10 min)

- Address participant questions
- Recommend resources: Python documentation, YouTube channels, online courses, project ideas

(All of the codes, notebooks and slides will be provided.)