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
    - ✓ Basic Operations
    - ✓ 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.)