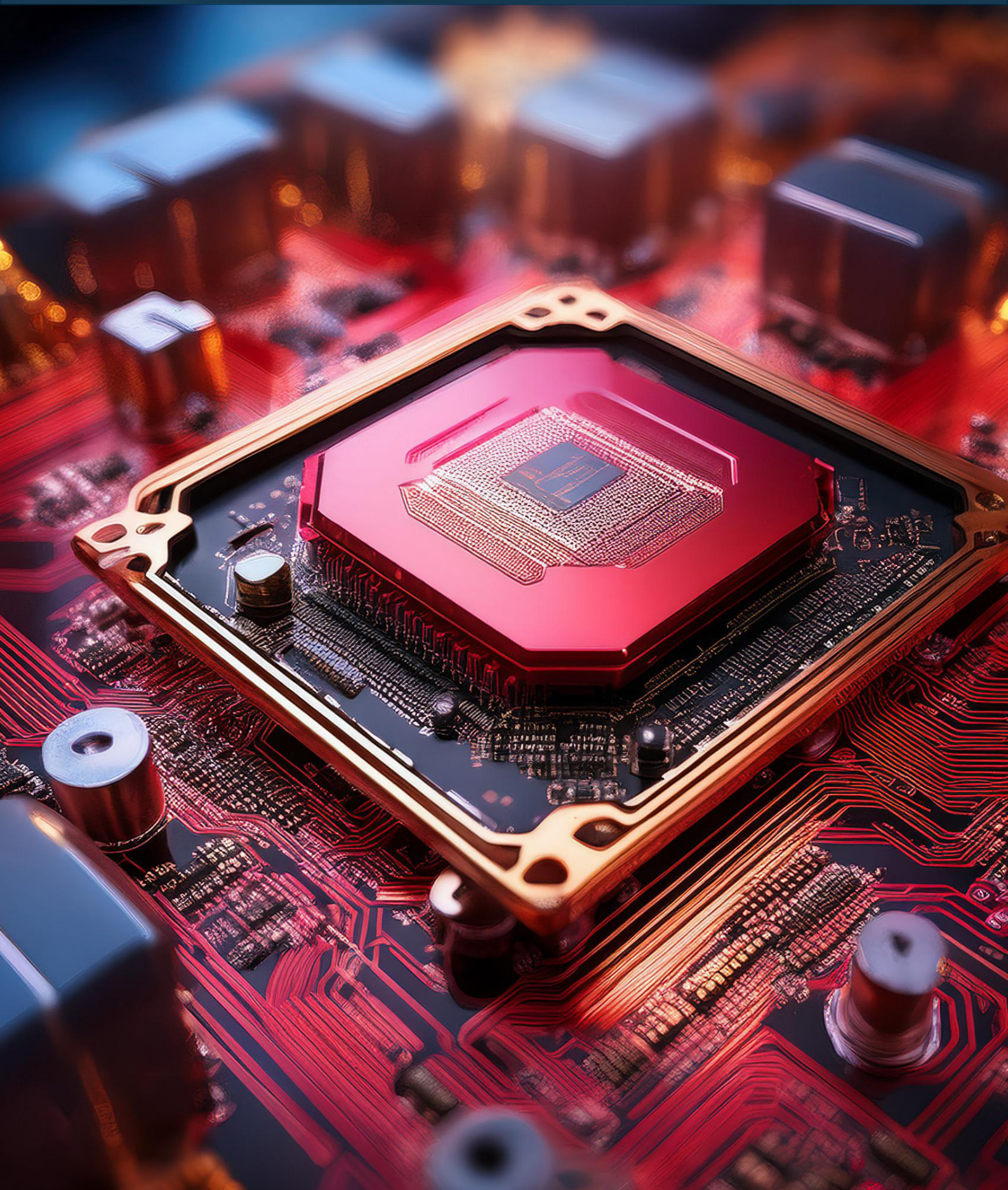
iMSD

Raspberry Pi Essentials



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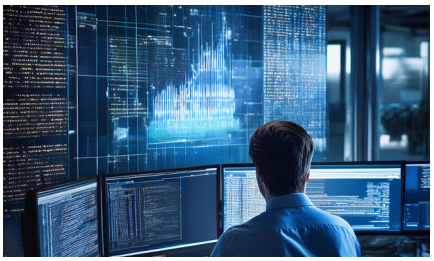

Duration: 3 Days

Related Courses:
Phython, C++, MATLAB, Java, C#, Lisp, Pascal, Scratch,

Course Overview and Objectives

This introductory Raspberry Pi course is designed to equip students with the knowledge and skills needed to work with Raspberry Pi single-board computers.

The course provides a comprehensive introduction to Raspberry Pi hardware, software, and applications, including basic Linux operations, Python programming, and various hardware interfaces. Through practical exercises and projects, students will learn how to create and manage Raspberry Pi-based systems for diverse applications.

Pre-requisites:
Basic knowledge of mathematics (calculus and linear algebra) and programming (e.g., Python or C++) is recommended but not required.

Course Format:
Lectures, hands-on labs, assignments, and a final project.

RaspberryPI Course Outline

Introduction to Raspberry Pi

- Overview of Raspberry Pi models.
- Applications.
- Differences between Arduino and Raspberry Pi.
- Setting Up the Raspberry Pi
- Installing an OS (Raspberry Pi OS) on an SD card.
- Initial boot and configuration (using NOOBS or direct installation).
- Basic command-line navigation.

Basic Linux Commands and Shell Scripting

- Introduction to Linux
- Understanding the Linux filesystem.
- Basic Linux commands (e.g., `ls`, `cd`, `cp`, `mv`, `rm`, `nano`, `sudo`).
- File Permissions,
- Management.
- Understanding file permissions.
- Managing users and groups.
- Basic Shell Scripting
- Writing simple bash scripts.
- Automating tasks with cron jobs

Python Programming on Raspberry Pi

- Introduction to Python
- Basic Python syntax.
- Variables.
- Data types.
- Operators.
- Control structures.
- Loops.
- Conditionals.
- Functions and modules.
- Working with GPIO Pins
- Understanding GPIO pins and their configuration.
- Controlling an LED with Python.
- Reading input from a button.

Connecting to Sensors and Modules

- Working with Sensors
- Reading data from temperature and humidity sensors (e.g., DHT11/ DHT22).
- Using a PIR sensor for motion detection.
- Interfacing with Displays
- Connecting and programming a 16x2 LCD display.
- Displaying sensor data on an OLED screen.
- Using Analog Sensors
- Introduction to ADC (Analog to Digital Converter).
- Reading analog sensors with an MCP3008 ADC chip.

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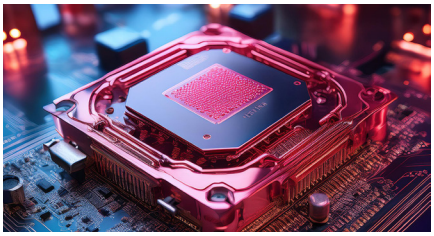
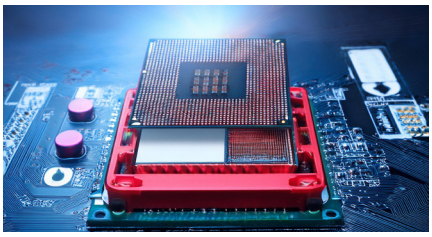


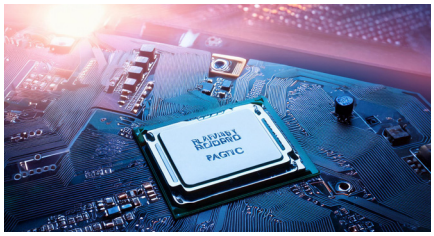
Set Up the Raspberry Pi

Install and configure the Raspberry Pi OS (formerly Raspbian) on an SD card.



Programming

Introduce Python programming language and its use on Raspberry Pi.Write Python scripts to interact with GPIO pins and other hardware.



Interface

Connect and use various sensors and modules, such as temperature sensors, motion detectors, and displays.

Networking and Remote Access

- Setting Up Wi-Fi and Ethernet
- Configuring Wi-Fi and Ethernet connections.
- Static vs. dynamic IP addresses.
- Remote Access
- Using SSH to access Raspberry Pi remotely.
- Setting up VNC for remote desktop access.
- Basic Networking Projects
- Setting up a simple web server using Flask.
- Controlling GPIO pins via a web interface

Camera and Multimedia Projects

- Using the Raspberry Pi Camera Module
- Installing and configuring the camera module.
- Capturing images and videos using Python.
- Creating a simple time-lapse or surveillance system.
- Media Center with Raspberry Pi
- Setting up Kodi (OSMC/LibreELEC) as a media center.
- Streaming media from the Raspberry Pi.

IoT and Cloud Integration

- Introduction to IoT
- Overview of IoT concepts and applications.
- Using MQTT for IoT communication.
- Connecting Raspberry Pi to the Cloud
- Sending data to cloud services (e.g., AWS, Google Cloud, ThingSpeak).
- Visualizing data in real-time dashboards.
- Home Automation Project
- Creating a simple home automation system.
- Controlling appliances via a web interface or mobile app.

Project Development and Presentation

- Project Planning
- Selecting a final project idea.
- Creating a project plan and schematic.
- Gathering necessary components and resources.
- Building the Project
- Writing and testing the code.
- Assembling the hardware components.
- Project Presentation
- Presenting the completed project.
- Discussing the challenges faced and solutions implemented.
- Future Learning Paths
- Exploring advanced Raspberry Pi projects (robotics, AI, machine learning).
- Introduction to other single-board computers (e.g., Jetson Nano, BeagleBone).

We offer online support to clients on content covered on our courses.