



1. Embedded System Fundamentals – 10 days

- 1.1 Microcontroller Basics
- 1.2 Reading Microcontroller Datasheets for features
- 1.3 Key specifications review and comparison
- 1.4 Identifying the right microcontroller for a design

Practical Assignment: You will be given a product development specification and you have to identify the best fit microcontroller for this product development. You have to consider cost and performance and make a design tradeoff in choosing the right microcontroller.

2. Sensors and Sensor Interfacing – 10 days

- 2.1 Sensors and their functions
- 2.2 Reading sensors datasheet
- 2.3 Interfacing sensors with microcontrollers
- 2.4 Concepts of filtering and debouncing sensor inputs
- 2.5 Polling vs Interrupt driven sensing of sensor inputs

Practical Assignment: You will be given a sensor to interface with a microcontroller. You have to identify the interface circuit, any filtering required and come up with a strategy that is best suited to sense signal from that sensor- either polling or interrupt based.



3. Output devices and control Interface– 10 days

3.1 Different output devices and their function

3.2 Learning to interface with output devices – I2C/SPI/I2S/UART

3.3 Interfacing output devices with microcontroller GPIOs

Practical Assignment: You will build on previous assignment to sense a signal from a sensor and send the sensed data to an OLED display through I2C interface. Also use UART to send the sensor data to serial monitor and store the sensor data in an external Flash memory through SPI interface.

4. Embedded Programming & Product Development – 15 days

4.1 Understanding Programming Frameworks

4.2 Choosing a framework - Arduino/Keil/STMCube/ESP-IDF

4.3 Building a real product with sensors, logic and output.

4.4 State Machine Paradigm in Programming

4.5 Modular Programming and Design Patterns

4.6 Handling Interrupts from multiple sensors

4.7 Using LLM AI Chat assistants –Cursor/Copilot

Practical Assignment: You will build a complete firmware for a product that requires sensor inputs, state machine based processing with interrupt handling, support touchscreen for user input/output and extensively use Cursor/Copilot for this firmware development. A final review will require you to explain every statement in your code and the overall code logic.

Course Completion Certificate:

You will be given a course completion certificate with evaluation report based on your performance in the Practical Assignments. Your score in the assessment indicates to potential employers of your hands on capability and job readiness.