



Project No.  
8005EC

Date  
2025

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EOTSS8005

Serial No  
8005/2025

Rev.  
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Electronic

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المعهد الهندسي لخدمات التكنولوجيا والبرمجيات

Engineering office for Technology and Software Services

## Microelectronics & Microcontrollers

ENGINEERING OFFICE FOR TECHNOLOGY AND SOFTWARE  
SERVICES ACADEMY

# Microelectronics & Microcontrollers

### Target Audience

- ✓ Electronics & Electrotechnics Engineers
- ✓ Analog & Digital Circuits
- ✓ Power Management

### Course Content

#### Level 1: Introduction to Microelectronics

- ✓ Semiconductors & IC Technology
- ✓ Analog & Digital Circuits
- ✓ Power Management

#### Level 4: Programming Microcontrollers

- ✓ Embedded C & Assembly Language
- ✓ Using Development Tools
- ✓ Real-time Operating Systems (RTOS)

#### Level 2: Microcontrollers Basics

- ✓ Embedded C & Assembly Language
- ✓ Using Development Tools
- ✓ Real-time Operating Systems (RTOS)

#### Level 5: Advanced Topics & Project Development

- ✓ PCB Design for Microcontrollers
- ✓ Power Optimization & Low-Power MCUs
- ✓ Final Project

### Materials Included

- ✓ Lecture Notes & PDFs
- ✓ Circuit Schematics & Design Files
- ✓ Video Tutorials & Code Examples
- ✓ Understand microworld
- ✓ embedded system architecture

### Learning Outcomes

- ✓ Understand microelectronic fundamentals & microcontroller architectures
- ✓ Write firmware & develop embedded applications with industry tools
- ✓ Interface sensors & communicate using multiple protocols

Code: 8007-EC



Course: Microelectronics & Microcontrollers



Target Audience

Main Branch: United building – E Shams –Front NBE  
, El Siouf \_Alexandria

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-  **Electronics & Electrical Engineers** – Professionals working in **circuit design & embedded systems**.
-  **Students & Researchers** – Studying **microcontrollers, digital circuits, and system design**.
-  **Embedded Systems Developers** – Engineers building **IoT, automation, and robotics solutions**.
-  **Hobbyists & Makers** – Enthusiasts exploring **microcontroller-based projects**.

## **Course Content**

### **Level 1: Introduction to Microelectronics**

 **Semiconductors & IC Technology** – Understanding MOSFETs, transistors & fabrication.


 **Analog & Digital Circuits** – Basics of op-amps, logic gates, and circuit design.

 **Power Management** – Voltage regulators, converters & energy efficiency.

### **Level 2: Microcontrollers Basics**


 **What is a Microcontroller?** – Overview of MCU architecture & functionality.

 **Popular Microcontrollers** – AVR, PIC, ARM Cortex, ESP32, STM32.

 **Memory & I/O Interfaces** – Understanding RAM, Flash, GPIO, ADC/DAC, UART, I2C, SPI.

### **Level 3: Programming Microcontrollers**


 **Embedded C & Assembly Language** – Writing **firmware & low-level code**.


 **Using Development Tools** – IDEs, debuggers & simulators (Keil, MPLAB, Arduino, ESP-IDF).

 **Real-time Operating Systems (RTOS)** – Basics of FreeRTOS & embedded multitasking.

### **Level 4: Interfacing & Communication**

 **Sensors & Actuators** – Connecting temperature, motion, and pressure sensors.


 **Communication Protocols** – UART, SPI, I2C, CAN, Bluetooth, Wi-Fi, LoRa.

 **Embedded Systems Applications** – IoT, robotics, automation & industrial control.

### **Level 5: Advanced Topics & Project Development**

 **PCB Design for Microcontrollers** – Schematic, layout & manufacturing files.

 **Power Optimization & Low-Power MCUs** – Strategies for battery-powered devices.

 **Final Project** – Hands-on design of a **real-world embedded system**.

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-  **Materials Included**
-  **Lecture Notes & PDFs**
-  **Circuit Schematics & Design Files**
-  **Video Tutorials & Code Examples**
-  **Simulation & Debugging Tools**
-  **Hardware Kits & Software Resources**

#### **Learning Outcomes**

-  **Understand microelectronics fundamentals & microcontroller architectures.**
-  **Write firmware & develop embedded applications with industry tools.**
-  **Interface sensors & communicate using multiple protocols.**
-  **Design & implement real-world embedded systems.**

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