

**University of Jordan**  
**College of Engineering & Technology**  
**Department of Electrical Engineering**

2<sup>nd</sup> – 2023-2024

Dr. Jamal Rahhal (Rahhal@ju.edu.jo)



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**Course:** Microcontroller Applications– EE-0903233 (3 Cr. – Core Course)

**Catalog Data:** This course is designed to demonstrate the basics of microcontroller Systems with some engineering applications.

**Prerequisites by Course:** Microprocessors Systems and Languages.

**Prerequisites by topic:** Students are assumed to have a background of the following topics:

- Microprocessors.
- Electronics and Circuits.

**Textbook:** MICROCONTROLLER THEORY AND APPLICATIONS WITH THE PIC18F. Mohamed Rafiquzzaman, Second Edition, Wiley, 2018.

**References:**

- Make: Basic Arduino Projects, Don Wilcher, 2014.

**Schedule & Duration:** 30 lectures, 50 minutes each (including exams) and 30 hours in lab practice. 22 lectures, 75 minutes each (including exams) and 30 hours in lab practice.

**Minimum Student Material:** Text book, class handouts, scientific calculator, and an access to a personal computer.

**Minimum College Facilities:** Classroom with whiteboard, library, and computational facilities.

**Course Objectives:** The following basic course objectives are expected to be achieved during the course

- Build engineering common sense and insight in dealing with engineering applications.
- Understand the basic concepts of Microcontrollers.
- Build a comprehensive knowledge about Microcontroller Applications.

**Course Outcomes and Relation to ABET Program Outcomes:**

Students will be expected to develop the following skills/understanding upon the successful completion of this course:

- Understand the main concepts of Microcontrollers.
- Understand the Microcontroller I/O and Interrupts.
- Understand the C programming for Microcontrollers.
- Write C programs for Microcontrollers.
- Write Basic programs in Micro-Python for Microcontrollers.

### Course Topics:

Topic	Description	Contact Hours
T.1.	Embedded systems characteristics. Microprocessors versus micro controllers. Micro controller characteristics.	3
T.2.	General-purpose micro controllers. Examples of micro controller architectures. Interrupts, counters/timers, Input/output ports.	3
T.3.	Memory maps and addressing modes.	3
T.4.	Micro controller programming. Instruction set. Program development and use of assemblers.	6
T.5.	Digital to analogue and analogue to digital conversion in micro controllers. Data acquisition and distribution. Serial and parallel communications.	6
T.6.	Interfacing to external devices. Power consumption consideration.	6
T.7.	Projects. 1- Interfacing with sensors using Arduino. 2- IoT using ESP 8266 and ESP32. 3- Interfacing STM32F103. 4- Introduction to Sipeed Microcontrollers with NN.	30
T.8.	Real-time system and its constraints.	3
T.9.	Exams, and Reviews.	3

**Computer Usage:** Course work including assignments and the use of **Microcontrollers**.

**Attendance:** Class attendance will be taken every class.

**Assessments:** Exams, Quizzes, projects, and Assignments.

**Projects:** **Arduino Projects:** Using Sensors, LCD's and motors.

- I/O Digital and Analog.
- USART, SPI, I2C, I2S, CAN and one wire.

**STM32F103:**

- Capacitance meter.
- SDR Tx.

**ESP32 and ESP8266:**

- WiFi Server and Client.
- WiFi to Serial Bridge.
- IOT projects.

**Sipeed:**

- Micro-Python Face recognition.

**Grading policy:**

Course Work and Quizzes	30 %
Midterm Exam	30 %
Final Exam	40 %
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Total	100%

**Instructor:**

Instructor Name	Office Hours	Ext.	E-mail
Dr. Jamal Rahhal	M.W. 10:00-11:00		<i>rahhal@ju.edu.jo</i>

**Last Updated:** Feb. 25, 2024