

<b>SEMESTER</b> <i>Eight</i>	<b>DEPARTMENT</b> <i>Control Engineering</i>	<b>COURSE TITLE</b> <i>Embedded Systems</i>
<b>COURSE CODE</b> <i>EC803</i>	<b>HOURS</b> 3 <b>UNITS</b> 3	<b>COURSE SPECIFICATIONS</b> <i>Theoretical Content</i>

### **1- Introduction Embedded Systems**

- What is an Embedded System?
- Some Interesting Examples of Embedded Systems
- Embedded Computer Architecture.

### **2- Advanced hardware Embedded components**

- Embedded processors
- Memory types
- Direct memory access "DMA"
- Serial Ports: RS-232, UARTs )
- Adding Peripherals Using SPI
- Adding Peripherals Using I2C
- USB : Introduction to USB, USB Packets, Physical Interface, Implementing a USB Interface.
- Networks : CAN(control area network) , Ethernet: Adding an Ethernet Interface

### **3- Embedded systems programming using C language)**

- Identifier Declaration.
- C Statements, Structures, and Operations.
- Operators and Expressions.
- Logical instructions & Bit Shift Operators.
- Array and pointer
- Working with Emulators and Simulators.
- Working with time: interrupts, counters and timers

### **4- Building Hardware**

- Tools as Development Kits , Measurement Tools, In-Circuit Emulators and Construction Tools.
- Quick Construction: Breadboarding, Wirewrapping,
- Building It: Powering Up for the First Time, Add in the Processor, Some Thoughts on

Debugging, JTAG.

**4- Hardware Exercise Programs:**

**In this topic it must programming embedded systems with c language for many applications such as:**

- Keypad test program.
- LCD test program.
- A/D Converter Theory.
- Serial Peripheral Buses.
- Interface to sensor and actuator

**References:**

1. John Catsoulis, *Designing Embedded Hardware*, O'Reilly, 2005
2. Ibrahim, Dogan, *Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series*.2008
3. Tim Wilmshurst, *Designing embedded systems with PIC microcontrollers:principles and applications* , 2007.
4. Kirk Zurell, *C Programming for Embedded Systems*, 2000