



## JOHN CABOT UNIVERSITY

COURSE CODE: ENGR 226

COURSE NAME: " **Microcontroller Programming and Applications** "  
Summer Sample Syllabus

TOTAL NO. OF CONTACT HOURS: 60 (45 lecture + 15 lab)

CREDITS: 3

PREREQUISITES: CS160 Programming or permission of the instructor

OFFICE HOURS:

---

### **COURSE DESCRIPTION:**

An introduction to digital systems and microcontroller programming including basic logic functions, microprocessor architecture, input and display devices, sensors, motors, and C programming for microcontrollers. The emphasis is on programming a microcontroller in C for practical applications.

### **SUMMARY OF COURSE CONTENT:**

Number and data representations in the C programming language; logic fundamentals (AND, OR, NOT operations and logic gate implementations); logic memory elements (latches, flip flops, memory cells); fundamentals of Microcontroller (MCU) architecture; developing applications on a MCU programmed in C; interfacing with input devices (switches, keypads, and touch sensors); information display technologies and techniques; digital to analog and analog to digital conversion; MCU I/O, control, memory and timers; MCU interrupts; PLCs and control in an industrial environment

### **LEARNING OUTCOMES:**

Upon successful completion of this course, the student will be able to:

1. demonstrate an understanding the general structure and operation of a MCU including its use of registers, different types of memory, and manipulation of digital signals;
2. design user interfaces that employ input devices such as switches, keypads, touch sensors and output displays such as LEDs and Liquid Crystal Displays;
3. write MCU applications in C that employ sensors for input and act upon such input to control indicators and motors;
4. employ built-in MCU peripheral devices such as a timer/counter, analog to digital converter, serial port receiver/transmitter, and features such as interrupts in simple applications;
5. use finite state machine diagrams and flow charts to conceptualize and then implement an application design;
6. show proficiency in the use of modern tools designed by the practicing engineer involved in microcontroller software and hardware development and debugging.



## JOHN CABOT UNIVERSITY

### TEXTBOOK:

J.W. Valvano, “Embedded Systems: Introduction to the MSP432 Microcontroller”, Volume 1, First Edition, June 2015, ISBN: 978-1512185676

Lab and project kit (includes TI MSP432 Launchpad microcontroller development board)

### GRADING POLICY

#### -ASSESSMENT METHODS:

Assignment	Guidelines	Weight
Learning activities/exercises	Active learning assignments are designed to give the student the opportunity to practice the theory presented in lecture. Some assignments will have a pre-assignment portion that should be completed prior to the session, and are to be submitted with the overall assignment. Students are encouraged to work together to discuss conceptual issues but all submitted work must be independent work.	25%
Quizzes	There will be a quiz given weekly – from week 2 – covering material prior to that lecture (including homework, learning activities, and reading assignments).	50% (12.5% each)
Final Exam	There will be a comprehensive final exam to demonstrate mastery of critical parts of the course material.	25%
Homework	Homework assignments are intended to give students targeted problems that develop specific skills. These assignments are the students’ opportunity to prepare for the learning exercises and to practice for quizzes and the final exam. As such, diligence on the homework will be the responsibility of each student and homework will not be collected.	Not graded

#### -ASSESSMENT CRITERIA:

**A** Work of this quality directly addresses the task or problem raised and provides a coherent application of concepts displaying mastery of the skills learned. This type of work demonstrates the ability to critically evaluate concepts and theory and apply them with an element of novelty and originality. There is clear evidence of a significant amount of work beyond that required for the course.

**B** This is highly competent level of performance and directly addresses the task or problem raised. There is a demonstration of some ability to critically evaluate theory and concepts and relate them to practice. Work produced reflects students’ own adaptation and not simply a repetition of standard lecture. The work does not suffer



## JOHN CABOT UNIVERSITY

from any major errors or omissions and provides evidence of work beyond the required assignments.

**C** This is an acceptable level of performance and provides work that is clear but limited, reflecting the information offered in the lectures and resources.

**D** This level of performances demonstrates that the student lacks a coherent grasp of the material or skills. Important concepts are not applied adequately. In effect, the student has barely done enough to persuade the instructor that s/he should not fail.

**F** This work fails to show any knowledge or understanding of the task or problem. Most of the work produced is unacceptable or irrelevant.

### ATTENDANCE REQUIREMENTS:

Attendance is expected at all class meetings.

*Please refer to the university catalog for the attendance and absence policy.*

<b>TENTATIVE SCHEDULE (Modifications will be announced in class)</b>			
<b>Session</b>	<b>Session Focus</b>	<b>Assignment</b>	<b>Exam Dates</b>
Week 1	Logic Fundamentals		
Week 2	MCU Fundamentals		First quiz
Week 3	MCU Peripherals		Second quiz
Week 4	MCU Interrupts		Third quiz
Week 5	MCU ADC/DAC and PLC Introduction		Fourth quiz.  Final exam on Friday (comprehensive)