

- 1. Course number and name**  
COE 410 - Embedded Systems: Design and Applications
- 2. Credits and contact hours**  
3 credit hours, 5 contact hours
- 3. Instructor's or course coordinator's name**  
Dr. Abdul-Rahman Al-Ali
- 4. Textbook, title, author, and year**  
None

**Other supplemental materials**

References available in the AUS library as COE 410 course pack:  
<http://aus.libguides.com/c.php?g=477080&p=3262122>

- 5. Specific course information**
  - a. Brief description of content of the course (catalog description)**  
Introduces embedded systems computing platforms and examines their basic building blocks. Covers programming and interfacing, process-controlled and time-controlled interrupt handling. Explores communication methods and real-time operating systems. Evaluates embedded systems design requirements and specifications, reviews embedded systems emerging applications. Includes laboratory work and team projects.
  - b. Prerequisites or co-requisites**  
Prerequisites: COE 241 (Microcontrollers: Programming and Interfacing) and ELE 241 (Electronics I) or ELE 225 (Electric Circuits and Devices)
  - c. Indicate whether a required, elective, or selected elective course in the program**  
Required
- 6. Specific goals for the course**
  - a. Specific outcomes of instruction**  
This course requires the student to demonstrate the following:
    1. Describe and understand the principal characteristics of embedded systems computing platforms such as RISC (PIC) & CISC (68HCS12) based microcontrollers
    2. Ability to program and interface embedded systems
    3. Explore communication methods and real-time operating systems
    4. Apply embedded system design methodologies by engaging in requirements elicitation , and the implementation and testing of project assignments
    5. Investigate and analyze emerging embedded systems applications.

**b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course**

This course contributes in a significant way to the accomplishment of the following program outcomes:

<b>Program outcome</b>	<b>Emphasis in this course</b>
(a) an ability to apply knowledge of mathematics, science, and engineering	○
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	●
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	●
(d) an ability to function on multidisciplinary teams	◐
(e) an ability to identify, formulate, and solve engineering problems	●
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	◐
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	◐
(i) a recognition of the need for, and an ability to engage in life-long learning	○
(j) a knowledge of contemporary issues	◐
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	◐

Emphasis: ● High; ◐ Medium; ○ Low; Blank – Nothing Specific Expected

**7. Brief list of topics to be covered**

- i. Digital and analog inputs and outputs interface and programming review
- ii. Keypads, Alphanumerical displays and LCDs Interfacing and programming
- iii. Sensors and Actuators interface such as temperature, humidity, H-bridge and relays: design, implementation, measurement & error analysis
- iv. Timer Interrupts: Input Capture & Output Compare applications: Frequency measurement and PWM
- v. Interrupts Handling
- vi. Communication: Serial Communication (SCI), Serial Peripheral Interface (SPI) and Controller Area Network (CAN)
- vii. Wireless Embedded Systems Platform and Applications
- viii. Projects and Presentations.