

- 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:

| Program outcome | Emphasis in this course |
|---|--------------------------------|
| (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.