ECE 46500 – Embedded Microprocessor

Type of Course
Elective for EE, Required for CmpE Programs

Catalog Description
Design of microcontroller-based embedded systems; interfacing from both a hardware and software perspective; and applications, including audio, data acquisition, and communication systems.

Credits
3

Contact Hours
3

Prerequisite Courses
ECE 36200

Corequisite Courses

Prerequisites by Topics
Computer programming in C or C++ (ECE 22900) and microprocessor systems (ECE 36200);

Textbook
Embedded Systems: Real-Time Interfacing to ARM Cortex M Microcontrollers, current Edition, CreateSpace Independent Publishing Platform by Jonathan Valvano, 5th ed. ISBN-10: 1463590156, ISBN-13: 978-1463590154, 2016

Course Objectives
Provide the students an understanding of the principles and practices of embedded systems.

Course Outcomes

Students who successfully complete this course will have demonstrated
1. an ability to learn to program an embedded system in a high level programming language (1)
2. an ability to debug and troubleshoot embedded system from the perspectives of both hardware and software. (6)
3. an ability to measure the execution time of embedded system functions (6)

4. an ability to sample and analyze time jitters, ADC noises (6)
5. an ability to understand polling and interrupt in embedded system. (1)
6. an ability to communicate MCU through communication protocol, such as UART, etc. (2)
7. an ability to interface an analog sensor (e.g., potentiometer) and LCD with the MCU (1)
8. an ability to use MCU IDE tools (e.g., Keil) for design/debug. (7)
9. Understanding of fixed-point representation and its advantages compared to floating point representation (1)

Lecture Topics

1. C and hardware: Variables, Operators, Branching and Looping, Functions, Arrays, Structures and Pointers
2. Modular Programming: C Modules, Assembly Modules, Scope of Variables and Functions, Mixing Languages
3. Critical Region
4. FIFO Queue Analysis, Time Jitter
5. Graphics Device Driver
6. Hardware/Software Debugging
7. Alarm Clock Design
8. Music Player
9. Components, Operational Amplifier
10. Input Capture, Sensors, Threshold Detection,
11. Instrumentation Amplifier
12. Sampling, Nyquist Theorem, AD,DC Conversion
13. DC Motor, Tachometer, Stepper Motors
14. Keyboard LED Scanning
15. Floating Point

Computer Usage

High

Laboratory Experience

High

Design Experience

High

Coordinator

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Date

9/11/2021