EE-308 Microprocessor Based System Design

Spring 2022-2023

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Catalog Data: EE 308 Microprocessor Based System Design (4 cr.) Prerequisites: CS 303. Introduction to hardware and software design of microcomputer systems. Basic working principles of microprocessors, memory and I/O devices, bus interconnections, assembly language programming, integration of hardware and software design. Serial communications, parallel interfacing, interrupts and interrupt handlers, timing analysis and delay handling in microcomputer circuits. A term project involving the design and implementation of a self-contained microcomputer system for a specific purpose (i.e., embedded system) will be assigned, in addition to regular software/hardware lab assignments.

Reference Material:

- ATmega2560 Data Sheet
- AVR Instruction Set Manual
- AVR42787: AVR Software User Guide
- avr-libc Documentation : https://www.nongnu.org/avr-libc/user-manual/
- M. A. Mazidi, et al., *AVR Microcontroller and Embedded Systems: Using Assembly and C*, Pearson, 2014.
- Elliot Williams, *Make: AVR Programming*, Maker Media, 2014.
- Timothy S. Margush, *Some Assembly Required*, CRC Press, 2012.

Computer Usage: Assembler and C using avr-gcc and avr-libc.

Course Information and Software Resources:

- EE308 Course Web Page : http://acoustics.sabanciuniv.edu/ee308/
- AVR Toolchain : https://www.microchip.com/en-us/tools-resources/develop/microchip-studio/gcc-compilers
- PICSimLab : https://sourceforge.net/projects/picsim/
- AVRDUDE : https://www.nongnu.org/avrdude/
- AVRDUDESS : https://github.com/ZakKemble/AVRDUDESS

Goals: To develop the engineering skills of the students to design microprocessor based systems.

Prerequisites by Topic:

- Analysis and design of logic circuits.
- Basic computer organization, number representations and basic computing algorithms.
- Register transfer microoperations, datapaths, sequencing and control.
- C programming.

Weekly Schedule: (tentative)

01	Basic microcomputer structure	
02	Microcomputer programming: basics	
03	Microcomputer programming: memory management	
04	Microcomputer programming: I/O management	Lab#1
05	Microcomputer programming: data structures	
06	Interrupt interfacing and management I	Lab#2
07	Interrupt interfacing and management II	
08	Device driver design	Lab#3
09	Keypad, ADC/DAC and display device interfacing	
10	Serial interfacing: asynchronous protocols	Lab#4
11	Serial interfacing: synchronous protocols	
12	Sensor Interfacing: protocols and physical layer	Lab#5
13	DC Motor interfacing.	
14	DC Motor interfacing.	Project

General Rules

- Homework and lab assignments are announced one week before the deadline.
- No lab make-ups. Single exam make-up after the finals.

Grading: (tentative) Midterm 30%; Lab work & Project 35%; HWs 5%; Final 30%.