ECE0202: Embedded Processors and Interfacing

Lecture: Wednesday 10:15 – 11:55 am, 209, New Building, SCUPI

Lab: Friday 8:15 – 11:55 am, 206, New Building, SCUPI

Instructor: Fashu Xu
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TA:

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- Lab: Rende Gan 1420591294@qq.com

Course Description and Objectives:
The purpose of this course is to introduce students to microprocessors and interface circuitry. Students will learn the basic structure of ARM microcontrollers, including registers, data memory, instruction memory, GPIO structures, timers, counters, and interrupts. By means of an integrated microcontroller and programmer circuit board module, students will learn to interface with embedded system circuitry such as buttons, LEDs, stepper motors, keypads, and joysticks. Also, this course will help students develop an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

Prerequisites:
ECE 0201 Digital Circuits & Systems + Lab、ECE 0301ECE Problem Solving with C++

Textbook:
Yifeng Zhu, Embedded Systems with ARM Cortex-M Microcontroller in Assembly Language and C, 3rdEdition, ISBN-13: 978-0-9826926-6-0, Publisher: E-Man Press LLC; 3rd edition (July 2017)

Grading Scale

Quizzes	20%
Midterm I	10%
Laboratory Experiments	40%
Final Exam	15%
Homework	15%

A+	97.5-100%
A	92.5-97.5%
A-	90-92.5%
B+	87.5-90%
B	82.5-87.5%
B-	80-82.5%
C+	77.5-80%

C	72.5-77.5%
C-	70-72.5%
D	60-70%
F	0-60%

A “W” grade will be given only if requested before the deadline for withdrawal from the course.

Homework:

- Homework assignments will be assigned through courseweb and submission is required every two weeks.
- Late homework assignments will not be accepted.

Laboratory Projects:

- Each student will complete six lab projects during the semester. The labs will each be graded out of a total of 100 points.
- The lab deliverables consist of a demonstration and report/code submission.
    - Demonstration (50 points): full points will be given to a fully working project. A demonstration that does not work can only be given a maximum of 25 points, so make sure to complete every project!
    - Report/code (50 points): The report/code submission will be graded based on style, formatting, legibility, and how prevalent comments in the code are. If the demonstration did not work but the code contains all the necessary components and is well labeled the student may still receive full points for this section. Some general grade areas are:
        - 100%: Code is well structured, with concise, helpful comments
        - 75%: Code is missing comments in key areas or is poorly structured
        - 50%: Code works but is devoid of helpful comments
        - 25%: Code does not work and is incomplete
- 10 points will be taken off for each day that a deliverable is turned in late.

Exams:

- A midterm exam will be given during week 7.
- The final exam will be given during the final week.
- Attendance is mandatory. An unexcused absence from an exam will result in a 0 grade.
- Missing exams due to extracurriculars is not permitted. If you miss an exam due to a medical or family emergency you must provide documentation (such as a doctor’s note) and make up the exam through the testing center within 1 week, otherwise you will receive a zero for the exam.

Academic Integrity

All students are expected to adhere to the standards of academic honesty. Any student engaged in cheating, plagiarism, or other acts of academic dishonesty would be subject to disciplinary action. Any student suspected of violating this obligation for any reason

during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity http://www.provost.pitt.edu/info/ai1.html. This may include, but is not limited to the confiscation of the examination of any individual suspected of violating the University Policy.

Tentative Schedule

Week	Lectures	Lab
1	Course Introduction / board – 90 min (38 slides)	
2	Dev kits + KEIL / debug - 45 min (44 slides)	Lab 1 - Introduction
	Lab 1 Overview+ Arm core architecture – 45 min (32 slides)	
3	Number representations & bit mask – 45 min (51 slides)	
	C examples + GPIO introduction – 45 min (40 slides)	
4	GPIO in detail – 35 min (24 slides) + 10m quiz	Lab 2 – LED/pushbutton (C)
	Lab 2 overview + Assembly instruction format – 45 min (31 slides)	
5	Logic and Arithmetic instructions – 80 min (32 slides) + quiz – 10 min	
6	Lab 3 overview & review – 35 min + quiz – 10 min	Lab 3 – Counting / 7-segment displays (assembly)
	Load / Store (with GPIO) & memory (52 slides) – 45 min	
7	Branching and comparison – 35 min (45 slides) + quiz – 10 min	
	Stack + intro to subroutines – 45 min (22 slides)	
8	Subroutines – 35min (48 slides) + quiz – 10 min	Lab 4 - Keypad scanning (assembly)
	Lab 4 overview + Review for exam – 45 min	
9	Midterm Exam – 90 min	
10	Interrupts – 45 min (55 slides)	
	Interrupts in Detail – 35 min (41 slides)	
11	May Day	
12	More interrupts – 35 min (46 slides) + quiz – 10 min	Lab 5 – Stepper Motor (assembly)
	Lab 5 overview + Stepper motors – 45 min	
13	RTC – 35 min (43 slides) + quiz – 10 min	
	Timers – 45 min (37 slides)	
14	Fixed/Floating point – 35 min (42slides) + quiz – 10 min	Lab 6 – RTC watch (C)
	Lab 6 overview + UART – 45 min (28 slides)	

15	More UART – 35 min + quiz – 10 min	
	SPI/i2c – 45 min (41 slides)	
16	ADC&DAC – 45 min (20 slides)	
	DMA – 45 min (31 slides)	
17	Multitasking – 35 min (22 slides) + quiz – 10 min	
	Review for final exam – 45 min	