
Course Information

Course title:	EE/CE 4370 Embedded Systems		
Term:	Fall 2023		
Time & Venue:			
Lectures	Monday & Wednesday	8:30am - 9:45am	MC 2.410
Laboratory sessions	Monday	4:00pm - 6:45pm	ECSN 3.- - -

Professor Contact Information

Instructor:	Hossein Pedram
Email:	Hossein.Pedram@utdallas.edu
Office:	ECSN 4.312 (may change)
Consultation hours:	TBD
Teaching Assistant:	TBD

Course Pre-requisites and/or Co-requisites

Pre-requisites: CE/EE 3311, CE/EE 3320

Co-requisite: CE/EE 4304

Basically, digital logic background and C programming

Course Description

The objectives of this course are to understand how embedded system work and in particular the microcontroller. In particular:

- Details of a microcontroller unit architecture. Including, the Program Counter, Stack, Status Register, General Purpose Registers and ALU.
 - Instruction Set Architecture
 - Memories (SRAM, DRAM, EPROM, EEPROM) and Memory Mapped IO peripheral devices.
 - Peripheral devices, including general purpose IOs (GPIOs), synchronous and asynchronous serial communication interfaces including UART, SPI and I2C.
 - Analog to Digital Conversion (ADC)
 - Programming the microcontroller using C language.
 - Finite State machines
 - Interrupts and low-power event driven programming
 - Internet of Things – IOT.
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Teaching and Learning Materials:

Lecture notes and other teaching and learning materials can be downloaded from **eLearning**. Announcements on teaching and course administration issues will be posted online. You **must** check the announcements regularly.

Textbook:

[T1] Embedded Systems: Introduction to Arm® Cortex™-M Microcontrollers, Fifth Edition (Volume 1) 5th Edition, By: Jonathan W Valvano, ISBN-13: 978-1477508992, ISBN-10: 1477508996

[T2] Embedded Systems: Real-Time Interfacing to Arm Cortex-M Microcontrollers, 5th Edition, By: Jonathan W Valvano, ISBN-13: 978-1463590154, ISBN-10: 1463590156.

[T3] C Programming Language (2nd Edition), Authors: Brian W. Kernighan, Dennis M. Ritchie, Publisher: Prentice Hall (April 1, 1988), ISBN: 0131103628

[T4] TM4C123 Data sheet and user guides, ebook (freely available on www.ti.com)

References:

[R1] TI Tiva ARM Programming for Embedded systems, By: M.A. Mazidi, ISBN-10-09979255922.

Assessments

- Lab performance and reports 30%
- Assignments: 20%

Examinations (50%)

- Examination 1 (25%)
- Examination 2 (25%)

Attendance will be rewarded. (Up to 5%)

Examinations:

There will be two non-cumulative examinations for this course, each covering approximately half of the material. Both exams will be administered during regular class meeting times and will be graded by the instructor.

Exams: Two exams will be given during the semester. **No make-up exams will be given, except under dire circumstances, such as serious illness – with doctor's note.**

How to do well on the exams?

The questions on the exams will be similar to the Homework problems and Questions on Lab assignments. Nothing will be given out this context.

Lecture, Lab, and HW Schedule:**Lecture Time:** 8:30am -9:45am, Monday & Wednesday**Lab Time:** 4:00pm-6.45pm Monday

Session	Lecture	Lab	HW
1	Introduction to embedded systems	Lab1: setting up the launchpad	HW1 - Introduction
2	Number systems		
3	Microcontroller architecture and assembly language	Lab1	HW1
4	Assembly language programming		HW2 – Microcontroller Architecture
5	Review of HW2	Lab2: Controlling Switches, LEDs, and Keyboard.	
6	Mixed C and Assembly programming (Review Lab2)		HW2
7	GPIO, Review of Lab3	Lab2 Lab3: Repeat Lab2 in C	
8	Review of ANSIC		HW3: Assembly language
9	Review of HW3, Review of C continued	Lab3	
10	Review of HW4, Introduction to Interrupts		HW3, HW4: C language
11	Interrupts	Lab4: Interrupts and Systick	
12	Systick Timer, Review of Lab4		HW4
13	Test1: Wednesday Oct 4, 2023, in class	Lab4	

14	Finite State Machine, Review of Lab5	Lab5: Finite State Machines	HW5: Finite State Machines
15	Finite State Machines, Part 2, Review of HW5	Lab5	
16	PWM and DC Motor control, Review of Lab6	Lab6: PWM and temperature control	HW5
17	UART	Lab6	
18	Review of Lab7, ADC, DAC	Lab7: UART	HW6: ADC and DAC
19	ADC, DAC, Review of HW6	Lab7	
20	Review of Lab8	Lab8: DAC and ADC	HW6
21	ESP32-CAM, an industrial development board.	Lab8	
22	Wireless communication protocols BT and Wifi, Lab9	Lab9: ESP32 setup, an application (PWM), BT communication	
23	WiFi and TCP/IP protocols	Lab9	
24	Serial Communication, async and sync	Lab10: WiFi, SPI, and I2C communication protocols	HW7: Research
25	Sync Serial communication SPI, I2C protocols, Lab10	Lab10	
26	Real-time OS for embedded Systems	Lab11: RTOS, multiple thread applications, and Multiple core operation	HW8: Multitasking
27	Review of HW7		HW8
28	Test2: Wednesday Dec 6, 2023, in class		HW7

Posting date is in red. Due date is in black.

UT Dallas Syllabus Policies and Procedures

The information below constitutes the University's policies and procedures segment of course syllabi, as described in <http://go.utdallas.edu/syllabus-policies>

Technical Support:

If you experience any problems with your UT Dallas account, you may email assist@utdallas.edu or call the UT Dallas Computer Help Desk at 972-883-2911.

These descriptions and timelines are subject to change at the discretion of the Professor

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