EECE.4800/5520 Microprocessors II and Embedded System Design
Syllabus
(Fall 2017)

last update: 9/5/17

Basic Information

This three-credit course provides a continuation of the study of microprocessors begun in EECE.3170. Topics include CPU architecture, memory interfaces and management, coprocessor interfaces, bus concepts, bus arbitration techniques, serial I/O devices, DMA and interrupt controlled devices. Focus will be placed on the design, construction, and testing of embedded microprocessor systems. Hardware limitations of the single-chip system will be introduced along with microcontrollers, programming for resource constraint systems, interfacing, and communications, validating hardware and software, microprogramming of controller chips, parallel/concurrent programming, networking, and design methods and testing of embedded systems. Laboratories are directly related to microprocessor functions and embedded system designs.

Prerequisite: EECE.3110 - Electronics I Laboratory, EECE.3170 - Microprocessors Systems Design, EECE.3650 - Electronics I.
All students enrolled in EECE.4800/5520 Microprocessors Systems Design are required to have completed prerequisites or get permission from the Instructor. It is the student who is responsible for any adverse results such as being administratively withdrawn from the class or being ineligible for tuition refund due to the enforcement of these prerequisites.

Instructor: Prof. Yan Luo
Office Location: BL 407B
Office Hours: Mon 1-3pm, Wed 4-5pm or by appointments
Phone: (978) 934-2592
Email: Yan_Luo@uml.edu
Class time: Wed 6:30pm-9:20pm
Class location: Check SiS for latest information
Lab time: Open Lab through card access
Lab location: Ball Hall 424
TA: Ioannis Smanis
TA Office hours: To be posted on piazza.com
Course forum on Piazza: http://piazza.com/uml/fall2017/eece4800eece5520/home

Course structure

There is a 3-hour class on Wednesday evening each week. The class will be in the format of lecture and laboratory.

Course objectives

- Gain an understanding of embedded systems design.
- Become capable of evaluating and implementing memory system organization
- Gain an understanding of hardware system architectures.

- Understand different communication protocols and interfaces.
- Understand the interaction of hardware and software in embedded systems
- Become familiar of parallel and concurrent programming
- Understand emerging embedded system design technologies
- Develop and understand embedded software for different processor architectures

Text books ((Recommended but not required)

- Peter Barry and Patrick Crowley, Modern Embedded Computing: Designing Connected, Pervasive, Media-Rich Systems, Morgan Kaufmann; 1 edition (February 10, 2012) ,ISBN-10: 0123914906, ISBN-13: 978-0123914903
- Barry B. Brey, Intel Microprocessors, 8th Ed. ISBN-10: 0135026458, ISBN-13: 978-0135026458

Reference books:

- Introduction to Embedded Systems, by E. A. Lee and S. A. Seshia, 2011
- Break Away with Intel® Atom™ Processors: A Guide to Architecture Migration by Lori Matassa and Max Domeika
- Writing Linux Device Drivers: a guide with exercises, Jerry Cooperstein, ISBN: 978-1448672387
- Linux Device Drivers, 3rd ed. Available online.

Useful Resources:
http://learn.mikroe.com/ebooks/piccprogramming/
http://www.learningaboutelectronics.com/Projects/
https://learn.sparkfun.com/tutorials/galileo-getting-started-guide

Course Grade

Exam 1 (mid-term):	20%
Exam 2 (final) :	20%
Four Labs:	60%
Total:	100%

Note: This course is double-numbered. Students enrolled in EECE.4800 are graded on a different scale from those in EECE.5520. *Lab assignments and exams may contain questions required only for students in EECE.5520 or EECE.4800*. Generally 60% is the passing grade (D) for EECE.4800 students, 80% is the passing grade (B) for EECE.5520 students.

Policy on Lab Reports

1. Your labs will be graded upon your completion of the lab assignments and written lab reports. Your completion of the lab must be demonstrated to the TA during his/her office/lab hours. You must turn in your lab reports by the posted deadlines.
2. You must complete **your own** lab reports even though you work on the lab assignments in a team. No more than lab design documents (such as schematic and source code) can be shared among members in a team.
3. Copying lab reports is a serious offense to academic integrity. The violators will be given "F" in the course and reported to the University administration. UMass Lowell academic

integrity policy is at: https://www.uml.edu/Catalog/Undergraduate/Policies/Academic-Policies/Academic-Integrity.aspx

Tentative Schedule (subject to change).

Lab demos and reports are due by 10AM of Monday in the week. Note that you must demonstrate your labs to the TAs during their scheduled office hours in the prior week.

Week No.	Topics	Important Dates
1 (9/6)	Introduction to Embedded System Design	Project groups formed
2 (9/13)	Sensors and Data Acquisition Lab tutorial: PIC microcontroller and IDE , Lab 1 released	Lab1: PIC-controlled sensing.
3 (9/20)	Intro to x86 architecture, memory interfacing Lab 2 released	Lab 2: PIC+Galileo: sensor control and data acquisition
4 (9/27)	**Lab session (no lecture)**	
5 (10/4)	Interfaces and Buses	**Lab 1 Due 10/2**
6 (10/11)	PCI, DMA, interrupts, storage devices Lab 3 released	Lab 3: i2c and image processing
7 (10/18)	**Exam 1** **Followed by lab session**	
8 (10/25)	i2c bus, programming i2c devices	
9 (11/1)	Image processing on embedded platform	**Lab 2 Due 10/30**
10 (11/8)	Parallel programming and multithreading Lab 4 released	Lab 4 Multithreading and networking
11 (11/15)	Linux and device drivers	
12 (11/22)	Intel IA architecture, bootloader, performance profiling, debugging **Watch recorded lecture. No meeting.**	**Lab 3 due 11/20**
13 (11/29)	networking of embedded devices	
14 (12/6)	Emerging embedded system technologies	
15 (12/13)	Course review	**Lab 4 due 12/13**
Final Week	**Final exam according to university academic schedule**	