Winter 2018

To: SECS Faculty and ECE 6740 Students
From: Darrin M. Hanna, Ph.D., Professor of Engineering
Subject: ECE 6740 – Advanced Embedded Systems

Course Title

Advanced Embedded Systems

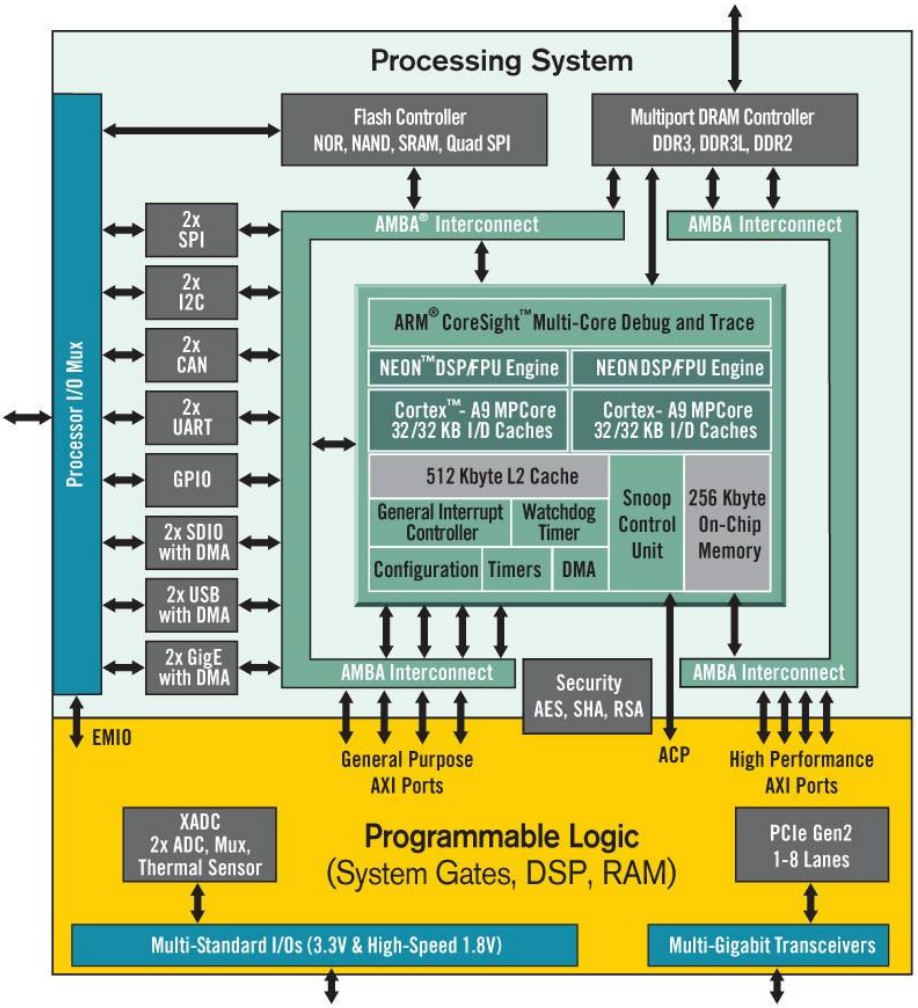
Prerequisites

ECE/CSE 4700/5700 (470/570) and ECE/CSE 3710/5760 (378 / 576) or equivalent experience with a microcontroller and VHDL with instructor permission

Text and Materials

There is no required text for this course. Groups will be required to purchase some hardware and materials.

Course Emphasis



Microprocessors, both CISC and RISC, have been the common platform for executing algorithms for decades. In order to increase the speed that an algorithm executes, microprocessor architectures have been optimized, modified, and created to decrease processing overhead and run at higher clock frequencies. There are many tradeoffs in terms of cost, power consumption, scalability, design time, and other important factors in this microprocessor paradigm. Over the past fifteen years, advancements in FPGAs have resulted in faster, cheaper, high-capacity reprogrammable chips that can be used to implement special-purpose hardware. In this course, we will focus on developing an intelligent embedded system for a military robot benchmarking its performance using several important metrics, and create special purpose hardware to work in cooperation with the microprocessor on a single chip to increase the overall system performance and to be able to solve problems that can not be solved using a microprocessor alone. At the end of this course, the experience that students will have will enable them to identify when a hybrid system is useful or required to implement a solution, design such a system, and implement and test the system.

Class Time

Classes will be held on Tuesday and Thursday from 7:30 p.m. to 9:17 p.m. in room 236 Dodge Hall of Engineering (DHE). Labs with computers, software, and hardware design boards are available in room 562 of the Engineering Center (EC). The lab will be accessible to you 24/7.

Course Objectives

By the end of this course a successful student will be able to:

- Identify a useful intelligent method and derive the appropriate parameters to implement the method on a micro-controlled application
- Design an intelligent embedded system that will control a system under real conditions
- Use an embedded microcontroller to capture and process input and produce output
- Identify algorithm bottlenecks and opportunities for optimizing the algorithm
- Design special-purpose hardware for performing specific tasks using VHDL
- Simulate VHDL designs and synthesize them on an FPGA using modern CAD tools
- Develop an efficient hybrid system including special-purpose hardware that interfaces with a microcontroller to significantly increase the performance of an intelligent system
- Discuss techniques for determining an optimal binding, allocation, and scheduling of tasks for a hybrid system.

Design Project

Each student will participate in a group project and demonstrate an original intelligent system by means of a PowerPoint presentation given to the class, a presentation poster that may be displayed publicly, and a project report. Students will receive individual project grades.

Exams

There will be two exams during the semester. There may be an oral part to these exams.

Grading

Grading will be based of the following:

Homework/Labs	25 %
Exam 1	20 %
Exam 2	20 %
Design Project	35 %
	100 %

A student earning below a 60% in the design project will receive a 0.0 in this course.

Office Hours: By appointment and walk-ins welcomed.
436 Engineering Center
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Class Web Site: http://moodle.oakland.edu