Course Syllabus

ECE 153A  The Hardware/Software Interface  Elective  4 units

Catalog Description:
Machine-level structures implementing the operating system abstraction; memory-mappers, multi-level interrupts, direct memory access techniques. Lowest-level software/firmware structures: micro-kernels, interpreters, emulators, threaded-code, real-time scheduling. Compilation and cross-compilation techniques; system initialization; validation and debugging; in-circuit testing.

Prerequisites:
Computer Science 130A with a minimum grade of C- and some low-level (C) programming experience.

Text, References, and Software:

Text and Required Reading:


Software:
Texas Instruments Code Composer (same system used in ECE 153B) using TMS320Cx simulation (as well as the program development and debugging environment).

User Mode Linux (for device driver implementation):
http://user-mode-linux.sourceforge.net/

Other suggested/related books (not required):


Topics Covered and Course Goals:
To introduce students to the topics, techniques, implementations, related the interface between hardware and software. The lectures, practice problems, and projects will expose students to and provide them with hands-on experience with instruction set architectures (with TMS320Cx focus), device basics and components (memory, I/O, DMA, UARTs, etc), addressing modes, compilation, interrupts, device drivers, compilation, optimization, an introduction to real time systems, OS/Realtime scheduling, virtual memory, and virtualization. We also employ the Texas Instruments
Code Composer IDE for multiple projects (using simulation only) to prepare students for ECE 153A.

**Class/Laboratory Hours:**
Lecture, 3 hours; laboratory, 1 hour.

**Contribution to Criterion 5**
ECE 153A contributes to criterion 5 by providing students with an opportunity to learn about the design and implementation of important engineering concepts from computer architecture, embedded systems, and software systems such as the operating system, compilers and assemblers, and simulation tools. The course also contributes to general engineering education of students through practical projects and practice problems that cover both general topics (C programming, architecture basics) and new topics specifically related to the practical engineering of components at the hardware/software interface of modern systems.

**Contribution to Program Outcomes:**
ECE 153A contributes to the following program outcomes: P1, P3, and P4

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