Basic info about the course
EEE7032-Embedded Systems
Spring 2018
Syllabus

What you will learn

- How programs are translated into the machine language
  - And how the hardware executes them
- The hardware/software interface
- What determines program performance
  - And how it can be improved
- How hardware designers improve performance
- What is parallel processing

Your background should be

- Basic knowledge about microprocessors/ microcontrollers
  - Any kind of assembly would be helpful
- Knowledge about any of high level programming languages:
  - C#
  - C, C++
  - Java
  - …
- Knowledge about any of Hardware Description Languages (HDL):
  - VHDL
  - Verilog
  - SystemC
  - …

Course Website, TextBook, Lecture Hours

- Course web site:
  http://www.salihbayar.com/Marmara/EE7032.html
- There is no need to buy any Text Book
  - But follow:
    - Computer Organization and Design MIPS Edition 5th Edition-The Hardware/Software Interface, David **Patterson** John **Hennessy**
    - Computer Organization and Design ARM Edition -The Hardware/Software Interface, David **Patterson** John **Hennessy**
    - Computer Organization and Design RISC-V Edition -The Hardware/Software Interface, David **Patterson** John **Hennessy**
- 3 hours of class every week (No LAB)
  - 3 hour lectures (lectured by the instructor)
    - 3 Lecture Hours: Monday, 16:30 – 18:20 (in the afternoon)

Software Programs and Tools

- **MARS (MIPS Assembler and Runtime Simulator)**
  - An IDE for MIPS Assembly Language Programming
  - http://courses.missouristate.edu/KenVollmar/mars/
- **LOGISIM (An educational tool for designing and simulating digital logic circuits)**
  - Design circuits using an intuitive graphical interface
  - Watch the circuits be simulated as they are drawn
  - https://sourceforge.net/projects/circuit/
- **Any kind of IDE for high level programming languages (Assembler & Disassembler Design)**
  - **Codeblocks, DevC++:** C, C++
  - **Microsoft Visual Studio Community Edition:** C, C++, C#
  - **Eclipse:** Java, C++
- **Hardware Design Platforms using HDL**
  - **ISE Design Suite (14.7 Currently)**
    - https://www.xilinx.com/support/download/index.html/content/xilinx/en/downloadNav/design-tools.html
  - **Vivado HL WebPACK Edition (2017.4 Currently)**
    - https://www.xilinx.com/support/download.html

Grading (Tentative)

- Project-1 (Midterm Grade 50%) 10%
- Project-2 (Midterm Grade 50%) 10%
- Homework-like assignments (HWLKA) 0%
- Academic Presentation 10%
- Project-3 10%
- Project-4 10%
- Attendance (If your attendance<70%, you fail!)
  - You have to attend at least 10 weeks.
- Final 50% (Your grade must be at least 50 according to faculty rules, otherwise you fail the exam.)

Projects (Tentative)

- Project-1 (Midterm Grade 50%) 15%
- Project-2 (Midterm Grade 50%) 15%
- Homework-like assignments (HWLKA) 0%
- Academic Presentation 10%
- Project-3 10%
- Project-4 10%
- Attendance (If your attendance<70%, you fail!)
  - You have to attend at least 10 weeks.
- Final 50% (Your grade must be at least 50 according to faculty rules, otherwise you fail the exam.)

- Project-1
  - 32-bit MIPS CPU Design and Implementation using Logisim
- Project-2
  - Assembler and Disassembler Development for MIPS CPU using C#, C, C++, Java…
- Academic Presentation
  - Presentation of a Conference/Journal paper or an advanced topic in embedded Systems
- Project-3
  - 32-bit Single Cycle MIPS hardware implementation using Verilog, VHDL, SystemC…
- Project-4
  - 32-bit MIPS hardware implementation using Verilog, VHDL, SystemC…

Course outline (Tentative)

WEEK-1 Introduction: Computer Abstractions and Technology
WEEK-2 Instructions: Language of the Computer and MIPS
WEEK-3 ARM8 Instruction Set
WEEK-4 The RISC-V Instruction Set
WEEK-5 Arithmetic for Computers
WEEK-6 The Processor: MIPS
WEEK-7 The Processor: RISC-V
WEEK-8 MIDTERM EXAM BREAK
WEEK-9 The Processor: ARM
WEEK-10 Performance Metrics
WEEK-11 Parallel Processors from Client to Cloud
WEEK-12 Academic Presentations-1
WEEK-13 Academic Presentations-2
WEEK-14 Academic Presentations-3
WEEK-15 Academic Presentations-4