

CS/COE0447: Computer Organization and Assembly Language

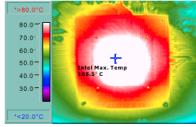
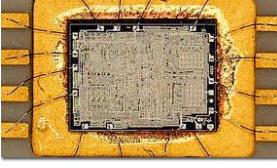


Course Introduction

Bruce Childers (CRN 11906)
Kelli Ireland (CRN 26473)

Spring 2011

Dept. of Computer Science
University of Pittsburgh

Course information

- Welcome to CS/CoE0447!
- Course web page: <http://www.cs.pitt.edu/~childers/CS0447>
 - Office hours & locations are available on this site for instructors & TAs
- Course schedule is available from this web page
 - **You are responsible for checking this page regularly!**
 - Schedule is tentative! Exam dates aren't expected to change.
- Instructors:
 - Dr. Bruce Childers (childers@cs.pitt.edu) [Sect: CRN 11096 SENSQ 5502]
 - Kelli Ireland (kireland@cs.pitt.edu) [Sect: CRN 26473 LAWRN 106]
- TAs (tentative assignment – this may change!):
 - Yu Du (fisherdu@cs.pitt.edu): HW/lab/project grading & limited office hours
 - Ryan Moore (rmoore@cs.pitt.edu): Recitations & office hours

Course information

- **Book:** *Computer Organization and Design* by Patterson and Hennessy, 4th Ed., Morgan Kaufmann, 2008.
- **Simulators:** MARS and Logisim
 - See web site for download links
- **Grade determination**
 - 12 lab. assignments, 20% of grade
 - MUST TURN IN 10 LABS TO PASS
 - 3 written homework assignments, 10% of grade
 - 3 programming assignments (2 MIPS, 1 logic design), 20% of grade
 - Exam #1, 15% of grade
 - Exam #2, 15% of grade
 - Exam #3, 20% of grade (final, cumulative)

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Course policies

- **Exams**
 - Closed book; calculators are OK
 - No make-up exam will be given unless prior approval is given
- **Labs (Recitations, MWF)**
 - You **must** complete 10 of 12 labs
 - Attendance will count toward your lab grade
 - You will be given a lab assignment each week
 - Each assignment can be partially done during the lab; submission deadline is the next lab meeting in a week
 - You can collaborate with a partner during the lab; however, each person must submit the completed work individually
- **Written homework, programming, design projects**
 - Assignments must be done alone
 - Late submissions are not accepted

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Course policies

- Two lectures & four recitation sessions
 - Questions about grading, course policies, etc., should be directed to the instructor for your registered lecture session.
- No switching recitations
 - **You should attend only the lab for which you have registered** unless special permission is given by your instructor.
 - Lab space is limited, so we need to strictly follow this policy
- Attending different lectures is allowed, except during exams
 - You may attend either lecture. However, seating may be limited and students registered for a lecture get first priority.
 - **Exams must be taken in your registered lecture section.** If you take the exam in the wrong lecture, it will not be graded.

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Course policies

- **Collaboration?**
 - Permitted in labs with one other person (lab partner)
 - Exams are closed book
 - Not permitted on written homework or programming/design projects
 - Not permitted on exams (closed book, calculators allowed)
- **When in doubt, ASK YOUR INSTRUCTOR.**
- **Result of cheating**
 - F for the course
 - Reported to appropriate Dean

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Late Assignments & Regrading

- **Late assignments**
 - Only with approved excuse by your instructor, with written documentation.
 - Events (sports, clubs, etc.) need *prior approval* for late submission.
 - Completed within one week of original date
- **You may ask to have an assignment regraded**
 - One short typewritten paragraph on paper (no e-mail)
 - By next class after receiving back assignment
 - Entire assignment is regraded
 - Grade may go *up or down*
 - A few points here and there.... isn't going to matter....

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Laptops, Cell Phones, Etc.



- "Computers" permitted only ***with permission***
 - Note taking only. No web surfing, e-mail, etc.
 - Computers in 5502 will be disabled during lecture.
- ***Turn off cell phones*** prior to start of lecture
 - I need a new cell phone!
 - If your phone rings (& it's a good phone ☺), it's mine!! ☺
- No laptops, tablets, smart phones, cell phones, MP3 players, voice recorders, cameras, etc., etc. during exams.
- A simple non-programmable calculator is permitted.

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Important dates

- 01/18: ADD/DROP deadline
- 02/14: Exam #1 (TENTATIVE)
- 03/28: Exam #2 (TENTATIVE)
- 04/25: Exam #3 (final, 2:00-3:50 pm, Monday)
- 01/17: Holiday (university closed)
- 03/06-03/13: Spring break (no class!)
- Week of 01/03 and 01/17: No lab
- 04/20 & Week of 04/20: Last lecture & lab

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Computer systems

- Why do we call a computer a computer?
- What makes a computer a computer?
- Three general classes of “computer”
- “Desktop computers”
 - Examples include PC, Mac, Chrome, Linux...
 - Notebooks, netbooks, tablets, ...
 - Interact with a user – applications
 - Handful of processors, gigabytes (10^9 bytes) memory, few terabytes (10^{12} bytes) of disk

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Desktop computers



CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Computer systems

- Why do we call a computer a computer?
- What makes a computer a computer?
- “Desktop computers”
- “Servers”
 - Web servers
 - Supercomputers
 - Interact with other computers to “solve a problem” or “provide services”
 - Dozens to thousands of processors
 - Gigabytes to terabytes memory
 - Petabytes (10^{15} bytes) of storage
 - Interconnected working together

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Servers

PITTSBURGH SUPERCOMPUTING CENTER

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Computer systems

- Why do we call a computer a computer?
- What makes a computer a computer?
- “Desktop computers”
- “Servers”
- “Embedded computers”
 - Hidden inside something not computer
 - Applications that run on these computers are specific
 - Interact with the “real world”
 - Multiple different processors for different functions
 - Kilobytes (10^3 bytes) to gigabytes of memory
 - Kilobytes to gigabytes of storage
 - Slow speed to exceptionally fast speed
 - Widest range of design!

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Embedded computers



CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Computers I Encountered Today



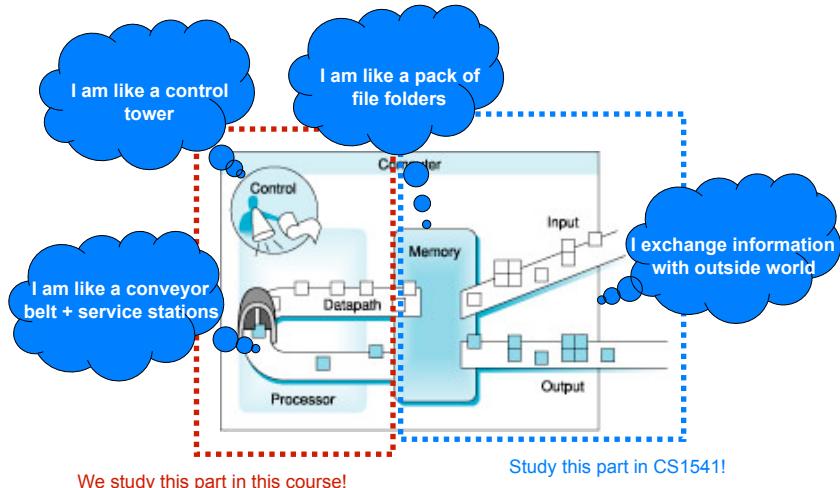
Common factors

- There may be different forms of “computation”
 - Example: digital TV tuner that converts a compressed digital motion picture format into something that we can view
- *Programmable computing machine* or a *processor*
 - Executes a *given* list of *instructions*
 - Includes input, output, storage/memory, computation
 - We can change its functionality based on what programs are used!
- What about our examples?
 - Desktop computers
 - Servers
 - Embedded computers
- What are the common factors that make a computer a computer?

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Five classic components



CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

In CS/CoE0447

- We study
 - Computer architecture
 - MIPS as the example architecture
 - Basic concepts of system software such as assembler, linker, compiler
 - Basic computer arithmetic
 - Binary numbers
 - Operations (add, sub, ...)
 - Basic logic design
 - Basic processor performance analysis
 - Processor organization
 - Datapath
 - Control
- We do
 - Assembly language programming (using MARS simulator)
 - MARS (written by a Pitt graduate!) <http://www.cs.missouristate.edu/MARS/>
 - Logisim logic design (implement our own processor!)

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Computer architecture?

- It's not about doing "architecture"

- It's about designing a computer system (esp. hardware)


CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

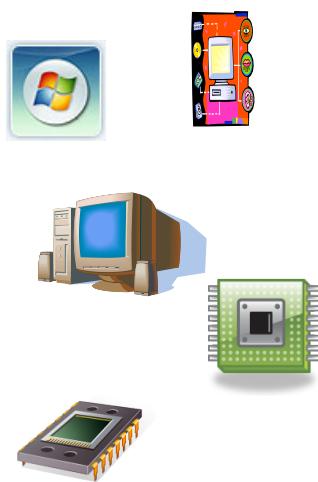
Computer architecture?

- We are interested in *principles* of designing computer hardware in this course and programming it at the lowest level
- Computer systems
 - Underlying hardware
 - Software running on it
- Computer architecture
 - The hardware/software interface seen by the user (as a programmer)
 - Instruction set architecture (ISA)
- Processor microarchitecture
 - Implementation of a given architecture
 - May or may not be visible to the user

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

Layers or views



- Our view of a computer system in this course is centered around the interface between the lowest level in software and the hardware
- We will talk a lot about assembly or machine *instructions*
- We will also learn about *logic design* and how to implement our own processor!

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh

MARS simulator

CS/CoE0447: Computer Organization and Assembly Language

University of Pittsburgh