As you wait for class to start, answer the following question:

What is important in a computer? What features do you look for when buying one?

- Memory size: GB, MB, TB
- Hard drive/SSD
- CPU: Intel vs. AMD, GHz
- I/O connection: USB, wireless, BT, GPU...
- Multi-core + how many
- Power supply
- OS
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ECE/CSE 469: Computer Design and Organization

Professor Scott Hauck, 307Q, hauck@uw.edu
Office hours: email w/schedule

TA: Niharika Mittal (mittal77@uw.edu)
    Vineetha Thomas (vthoma@uw.edu)

Office hours: (EEB-361) up-to-date times on website

Book:


Grading (approximate):

    20% - Homeworaks  35% - Design Project  20% - Midterm  25% - Final Exam
Prerequisites

Basic Logic Design and Boolean Algebra
  AND, OR, NAND, NOR gates
  Boolean Algebra
  D flip-flops, registers, and memories
  Binary numbers, 2’s complement, negation, overflows

Verilog

C/C++/Java programming

If you don’t know this material, **DO NOT TAKE THE CLASS**

If you don’t remember this material, **REVIEW NOW.**
Joint Work Policy

The processor design and homeworks will be done in groups of 1-2.

Groups may not collaborate on the specifics of homework or on the projects.
All submitted student work must be from their own efforts, and not from any other source.
Let me know if you need help forming groups.

OK:

Studying together for exams
Discussing lectures or readings
Talking about general approaches
Help in debugging, CAD tools peculiarities, etc.

Not OK:

Developing a design between groups
Implementing the CPU between groups
Checking homework answers between groups

Violation of these rules is at minimum:

Loss of twice the points of that assignment.
Report of Academic Misconduct to Dean’s Level
Potentially fail class, be expelled from UW.
Late Policy

All assignments due by the end of the class period

Late penalties;
- 10% for the first 24 hours
- 20% for the second 24 hours (total -30%)
- 30% for the third 24 hours (total -60%)
- 40% for all additional hours (total -100%)
Computer Architecture

Readings: 1.1-1.4

Interaction between hardware and software
Hardware sets realities, requirements
  Area, power, performance
Software places demands on hardware
  Processor only as good as software it runs
Implementing Software – The Compilation Process

C, C++, Java, ...

Compiler

Assembly Language

Assembler

Machine Language

Machine Code

CPU → Memory

/* Swap the ith and (i+1)th element of an array */
swap(int v[], int k) {
    int temp = v[k];
    v[k] = v[k+1];
    v[k+1] = temp;
}

SWAP:

- LSL	X9, X1, #3
- ADD	X9, X0, X9 // Compute address of v[k]
- LDUR	X10, [X9, #0] // get v[k]
- LDUR	X11, [X9, #8] // get v[k+1]
- STUR	X11, [X9,#0] // save new value to v[k]
- STUR	X10, [X9, #8] // save new value to v[k+1]
- BR	X30 // return from subroutine
Computer Organization

Five classic components

- **Computer**
  - Processor
    - Control
    - Datapath
  - Memory
    - Program
    - Data
  - Devices
    - Input
    - Output

Memory: Store instructions, data
Datapath: Perform operations (Add, subtract, ...)
Control: Orchestrate operations (who does what when)
Input: Get information from the outside world
Output: Provide results

keyboard, mouse
network, disk
monitor, printer
Execution cycle

- **Instruction Fetch**: Obtain instruction from program storage.
- **Instruction Decode**: Determine required actions and instruction size.
- **Operand Fetch**: Locate and obtain operand data.
- **Execute**: Compute result value or status.
- **Result Store**: Deposit results in storage for later use.
- **Next Instruction**: Determine successor instruction.