

## CS2011: Introduction to Machine Organization and Assembly Language

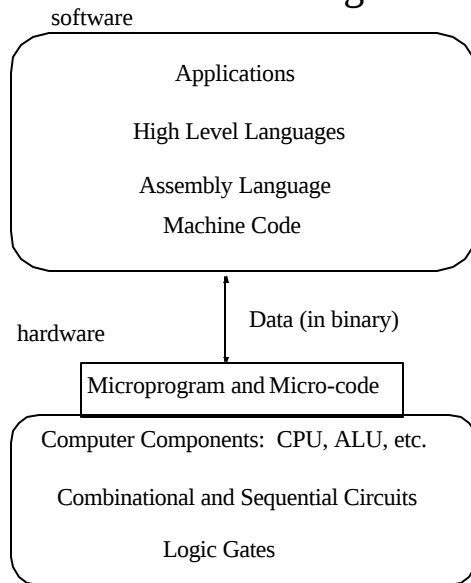
### Class 1: Introduction

- What we'll be learning!
- Logistics of the course
  - Who's who
  - Syllabus
  - Grading
  - etc.

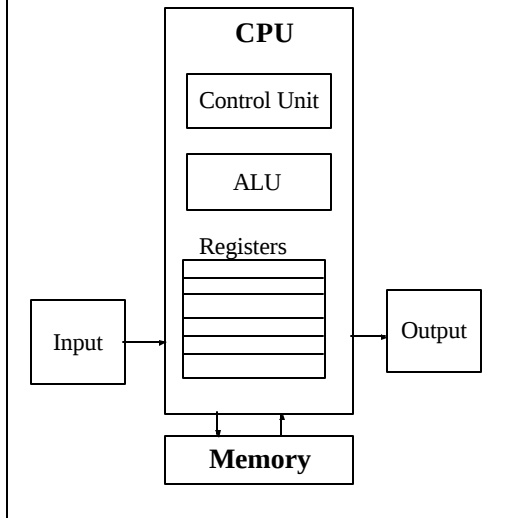
### CS2011: What We'll be Learning

- Major parts to the course:
  - Data representation (homework 1)
  - Machine code (homework 2)
  - Assembly language (homeworks 3-5)
  - Machine architecture (logic, circuits, microprogramming, etc.) (homework 6)

### How it All Fits Together



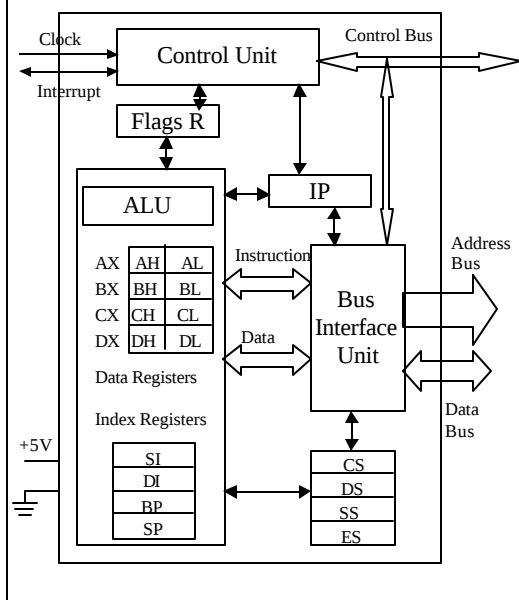
## Computer Organization



## CPU Components

- Constructed from:
  - combinational and sequential circuits (made from logic gates)
- Include:
  - Control Unit
  - Arithmetic logical unit (ALU)
  - Buses
  - Registers

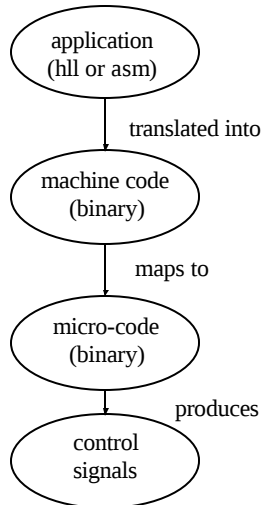
## 8086 Block Diagram



## Registers

- 8, 16, or 32 bit high-speed storage locations inside the CPU
- They can be accessed at a much higher speed than conventional memory.
- When optimizing for speed, use registers.
- Four types: general purpose, segment, index, status, and control

## Telling It What to Do



## What is Assembly Language?

## What is Machine Language?

## Example

- Assembly language instruction:

`mov al, 5 ;move 5 to the al register`

- Machine language instruction:

`101100000000101`

## Context

- table 1 from Irvine

## Why Learn Assembly Language?

## Comparison of Assembly Language and High Level Languages

- table 2 from Irvine

## Differences in Assembly Languages

- Our move example:
  - Intel: `MOV AL, 5`
  - MC6800: `MOVQ #5, D0`
- Defining memory:
  - Intel: `COUNT DW 5`
  - MC68000: `COUNT DS.W 1`  
reserves space only!

## Assembly Language Instructions

- A symbolic representation of a single machine instruction.
- Consists of a mnemonic and zero or more operands
- Operand types:

## Sample Program

- Figure 5 from text

## Teaching Staff

- Instructor: Janet Burge
  - office hours in FL144, M 1-2, Tu 10-11, Th 9-10, 1-2
  - email: [jburge@cs.wpi.edu](mailto:jburge@cs.wpi.edu)
- TAs and SAs:
  - Yali Zhu, Chunling Ma
  - Brian Roberts, ?
  - Office hours will be in Gordon Library – see the web for details
  - [cs2011\\_ta@cs.wpi.edu](mailto:cs2011_ta@cs.wpi.edu)

## Class Mailing Lists

- For the instructor and TAs:
  - [cs2011\\_ta@cs.wpi.edu](mailto:cs2011_ta@cs.wpi.edu)
  - This is what you should use for questions on the classwork!
- For the whole class (also includes instructor and TAs):
  - [cs2011@cs.wpi.edu](mailto:cs2011@cs.wpi.edu)
- You should be added to these automatically when you register for the course.

## Class Web Page

- <http://www.cs.wpi.edu/~jburge/courses/a01/cs2011>
- This will be updated throughout the course.
- This is also the best place to check to see when office hours are.

## Textbook

- Required:
  - K.R. Irvine, *Assembly Language for Intel-Based Computers*
  - R. Hyde, *The Art of Assembly Language Programming* – [http://webster.cs.ucr.edu/Page\\_asm/ArtOfAsm.html](http://webster.cs.ucr.edu/Page_asm/ArtOfAsm.html)
- Optional:
  - A.S. Tannenbaum, *Structured Computer Organization*
    - Five copies of the previous edition are on reserve at the library.

## Syllabus

- From web-page

## Lectures

- Partial lecture slides will be available on the web in advance of the lecture (PDF format).
- Most lectures will also include in-class exercises on the material covered in the lecture.
  - these are NOT quizzes
  - they are done in groups
  - you will be expected to have your book with you in class
  - you should take notes on them!

## Labs

- You *must* attend your scheduled lab section
- Bring:
  - your text (Irvine)
  - a floppy disk
  - a pen or pencil – you will be turning in your lab results

## Homework

- Due at the START of class on the day it is due. Homework is always due each Friday. Homework due-dates will not be extended until Monday unless Friday's class was cancelled.
- No late homework will be accepted under *any* circumstances (but lowest grade will be dropped)
- Homework will be returned during lab the following week.
- If you do not pick it up in lab, you can pick it up from the TA assigned to record grades for your lab section *during their office hours* (this will be posted on the web)

## Exams

- Closed book
- You can bring one 8 ½ by 11 sheet of paper (with notes, hand-written, both sides)
- NO CALCULATORS
- No make-up exams except in cases of serious health-related emergencies with appropriate documentation signed by a medical doctor.
- Sample exam questions will be posted one week prior to the actual exam. Sample exam answers will *not* be posted. Some problems will be worked out in-class, for others you will need to check your answers with a TA.

## Grading Policy

- Two Exams – 25% each: 50%
- Six Homework Assignments, 7% each, lowest dropped: 35%
- Six Laboratory Assignments, 2% each, lowest dropped: 10%
- In-Class Exercises – 5% total, lowest dropped

## Academic Honesty Policy

- All assignments must be performed *individually*.
  - Students may ask general questions of each other but should not see each other's homework assignments under any circumstances.
  - Working together on a homework assignment is considered an academic honesty violation.
  - Comparing homework answers is also an academic honesty violation.
- It is expected that students follow the policies of this class. There will be opportunities for collaborative work during class but homework assignments are not collaborative.

## Academic Honesty Policy (continued)

- If cheating is suspected the following procedure will be followed:
  - The students will receive a photocopy of their homework assignment rather than the original.
  - The instructor will examine the homework to determine if an academic honesty violation has occurred.
  - The instructor will meet with the students prior to computing final grades for the course to discuss the situation and give an appropriate penalty.