Expected / Projected / Actual Class Progression

Week 1 - 2/1

- Syllabus
- What's already assigned
- Install
- Questions
- Recording

Week 2 - 2/6 2/8

- Tuesday's Recording
- Thursday's Recording
- Apple Silicon
- Windows
- Intel Mac - get the distro, get QEMU, follow instructions for Windows except use your plain old terminal instead of WSL.
- Binary
- Powers of 2 up to 216
- Signed and Unsigned Integers
- 1's Complement and 2's Complement
- Registers
  - Integer Registers w & x
  - Why Have Registers
    - Speed of Processors Relative to RAM
  - *Up to this point was Tuesday 2/6. Thursday's class follows.*
  - Special Registers
    - Program Counter - pc
    - Stack Pointer - sp

Week 3 - 2/13 2/15

- Tuesday's Recording
- Thursday's Recording

- Floating Point Registers ***h***, s, d, v & q
  - h are half floats - not used much - are least significant half of s's
  - s are single precision values - least significant half of d's
  - d are double precision values - are least significant half of v's
  - v's are a vector of something
  - q's are a single 128 bit value
- Floating Point Construction
  - Floats / Doubles are approximations
  - Normalized scientific notation
    - Sign
    - Exponent
    - Mantissa
  - Single Precision - how above are implemented
  - Double Precision - how above are implemented
- Why Have Registers (Continued)
  - Steps Needed to Execute an Instruction
  - Pipelined Execution
- Aside:
  - Bit fields in C/C++
  - Unions in C/C++
- **Above this was covered Tuesday. Below this covered Thursday.**
- Special Registers (other than the *really* special registers)
  - Frame Pointer - x29
  - Link Register - x30
- How linking works - what is an object file
- Assembly Language!
  - `bl` branch with link (x30)
  - `ret` return (uses x30)
  - `and` bitwise and
  - `cbnz` compare and branch if non-zero
  - `cmp` compare (is actually a subtraction)

  - `b` unconditional branch
  - `.p2align` power of 2 alignment
  - `.text` what comes next is code
  - `.global` add "I have ____" to object file TOC
  - `str`, `stp`, `ldr`, `ldp` store to memory, load from memory
  - `beq` branch if the previous `cmp` is zero
  - `add` add two registers together and store result in a register
  - `mov` copy a value into a register
  - `.end` nothing else should come after this
  - `.asciz` put an ASCII string with null terminator into memory

Week 4 - 2/20 2/22

- 2/20/2024
- 2/22/2024
- **Tuesday**
  - Assembly Language
  - File descriptors
  - system calls using CRT vs making them directly
- **Thursday**
  - Assembly Language
  - Going if, for, while, continue, break

Week 5 - 2/27 2/29

- **Tuesday**
  - Review
  - 2/27/2024
  - All essays graded. 17 P1 left to grade - been quite sick so progress has been slow
  - Discuss essay
  - Common biggest error seen so far in P1 is calling write assuming that x0 through x7 are not corrupted.
    * Demonstrate `regs` a program designed to drive this point home.

  - P2 is assigned
  - Go over P2
  - `nm` demonstrated to demonstrate the "toc" i.e. the symbol table showing "have" and "need"
  - demonstrate running `as` directly
  - demonstrate running `cpp` directly
  - demonstrate asking c++ to leave behind a .S file
  - began discussion of structs
- **Thursday**
  - 2/29/2024
  - All P1 graded
  - Review
  - What is x29
  - malloc() - how it works
  - free() - how it works
  - **brief** introduction to virtual memory
    * history - none, fixed, static relocation, dynamic relocation (segmentation)
    * paging
    * linear page tables
  - P2 questions

"Spring Break"

Week 6 - 3/12 3/14

- **Tuesday**

  Class canceled due to injury to instructor.

- **Thursday**
  - The Debugging Talk

    Recording

Week 7 - 3/19 3/21

- **Tuesday**
  - Review and guided coding
  - Recording
- **Thursday**
  - We begin introducing hardware concepts
  - Spinning Disks
    - Speed and latencies
    - Construction
    - RAID (part 1)
  - Recording

Week 8 - 3/26 3/28

- **Tuesday**

  RAID (part 2)

  Spaghetti Code

  Review of Calling and Making "functions"

  Recording
- **Thursday**

  No class.

Week 9 - 4/2 4/4

- **Tuesday**

  Review

  Review of calling Assembly from C and C++.

  Review of function calls and parameters.

  Writing a recursive function. Example: factorial.

  Demonstration of recursion using GDB.

  SSDs

  Recording

- **Thursday**

  Review.

  What is the “this” pointer?

  Going over Project 4.

  Sample program doing floating point math.

Week 10 - 4/9 4/11

Week 11 - 4/16 4/18

Week 12 - 4/23 4/25

Week 13 - 4/30 5/2

Week 14 - 5/7 5/9