

## 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**

**Week 8 - 3/26 3/28**

**Week 9 - 4/2 4/4**

**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**