

# Essay Assignments - Spring 2024

## Assignment

Contribute a short essay on assigned topics from the following.

1. Discuss how well the original MIPS (1985) fit the criteria set by Colwell et al. for RISC, citing specific examples from the MIPS architecture to demonstrate your points.
2. Discuss how well the original MIPS fit the principles described by Wulf, citing specific examples from the MIPS architecture to demonstrate.
3. Compare ISA of the original MIPS (1985) with RISC-V focusing on the following: instruction families, addressing modes, instruction characteristics, and encodings. (Hunt for focus points in the long reference document.)
4. Compare the dynamic scheduling approaches of Tomasulo's algorithm with the scoreboard from the CDC-6600. How do these early approaches compare to a modern dynamic scheduling unit (from the 1990s and later)?
5. Review the ARM pipelines from the docs linked in Reading File and compare/contrast with the 5-stage classic MIPS (see last note below).
6. Pick a modern processor to review its architectural features. Discuss those related to workloads, performance, instructions, and instruction execution.
7. Use the CPU-Z tool (Google it) to check the cache organization in a machine you can access (your laptop, smartphone, desktop, or a workstation in one of our labs, surprise me!). Include a screenshot of relevant pages. Comment on characteristics and design choices in view of intended workloads for the processor. Compare to characteristics/limitations of early on-chip caches from Hill 1984.
8. Review the Intel Itanium, a novel architecture described as **EPIC**, and compare/contrast it to VLIW computers.
9. Examine the instruction set of Nvidia GPUs in terms of design and encoding. Compare core instruction families (arithmetic, L/S, branch) to classic MIPS instructions. What is the ISA classification (RISC... etc)?

## Objectives

- Use course information in a real-world context
- Revisit the material selectively and elaborate on parts of interest

## Notes

- Focus on course topics. Citing tech specs in context is OK, but essays should not be about listing memory amounts, core counts, performance figures, and similar (trade publication material).
- Look for: structures, organizations, computation models, characteristics of target workloads, and performance.

- While instruction overlapping generally is the basis of pipelining, it is more than old-school overlapping of general fetch-decode-execute phases. Recall physical pipeline stages are focused on principal functional units.
- Note required ARM material in the Reading File (see the datapath case study under the Background section).

## Submission

- All essays go under this discussion topic; they are due with the semester work portfolio.
- Don't link to external documents (write/save in Word, then copy-paste here to update, print from Gmail for inclusion in portfolio).