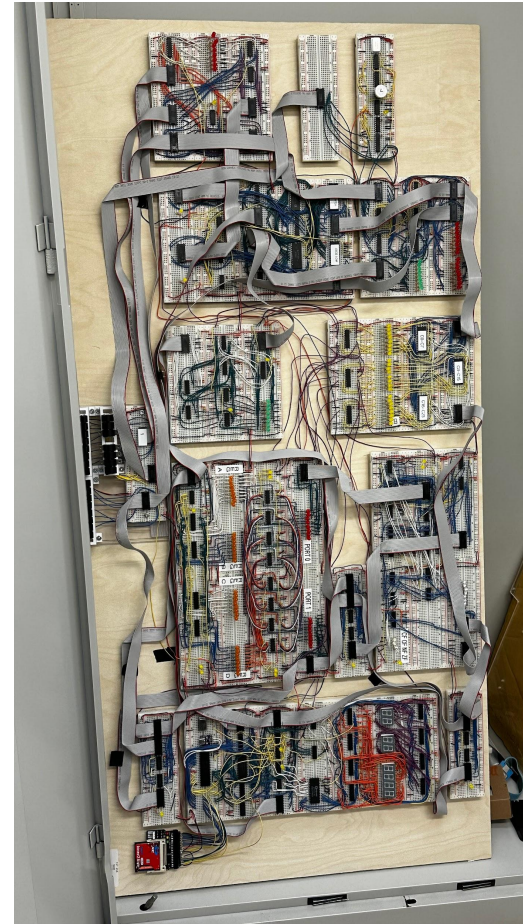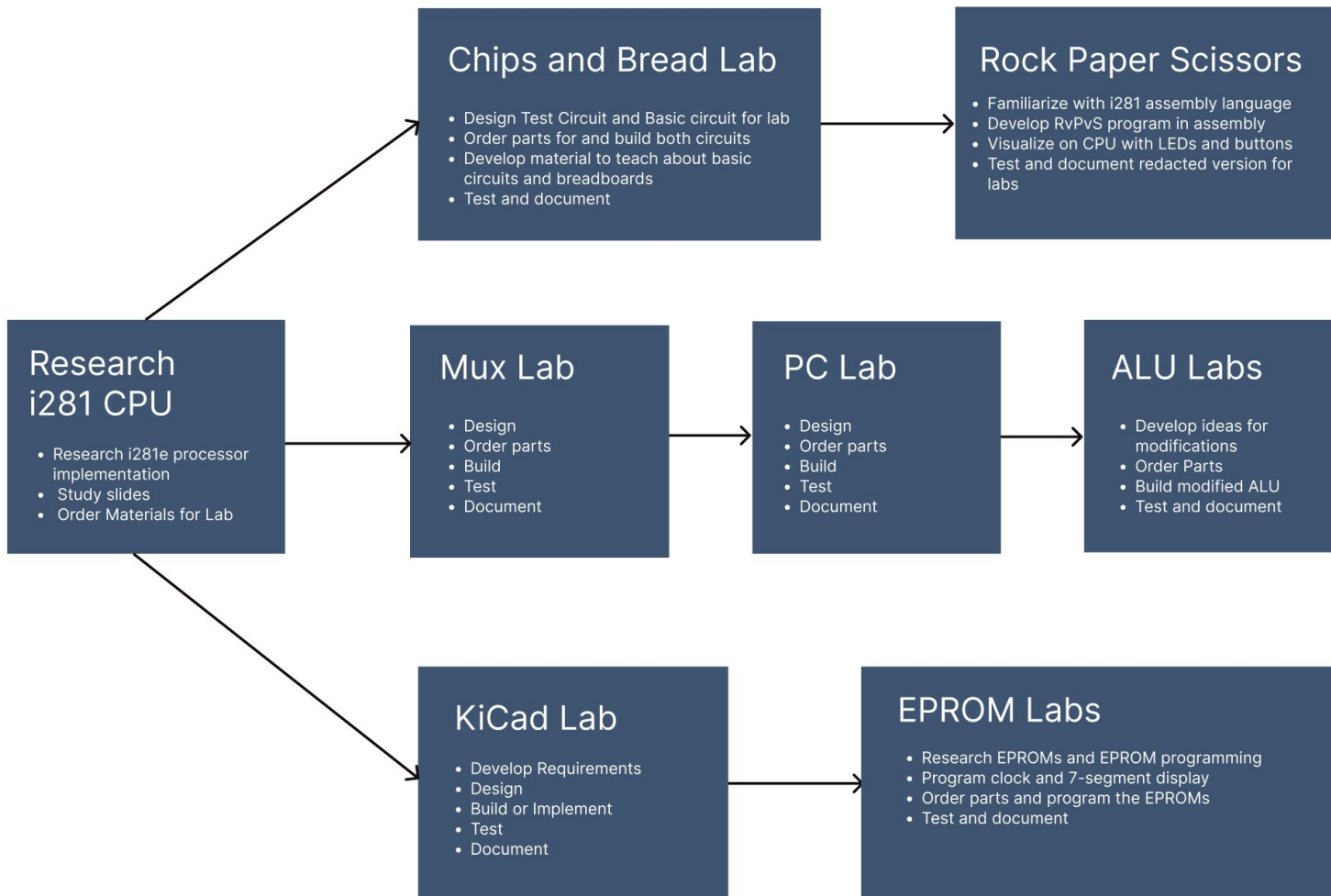# i281 CPU

sdmay25-31
Ariana Dirksen, Gigi Harrabi, Tessa Morgan, Ethan Uhrich
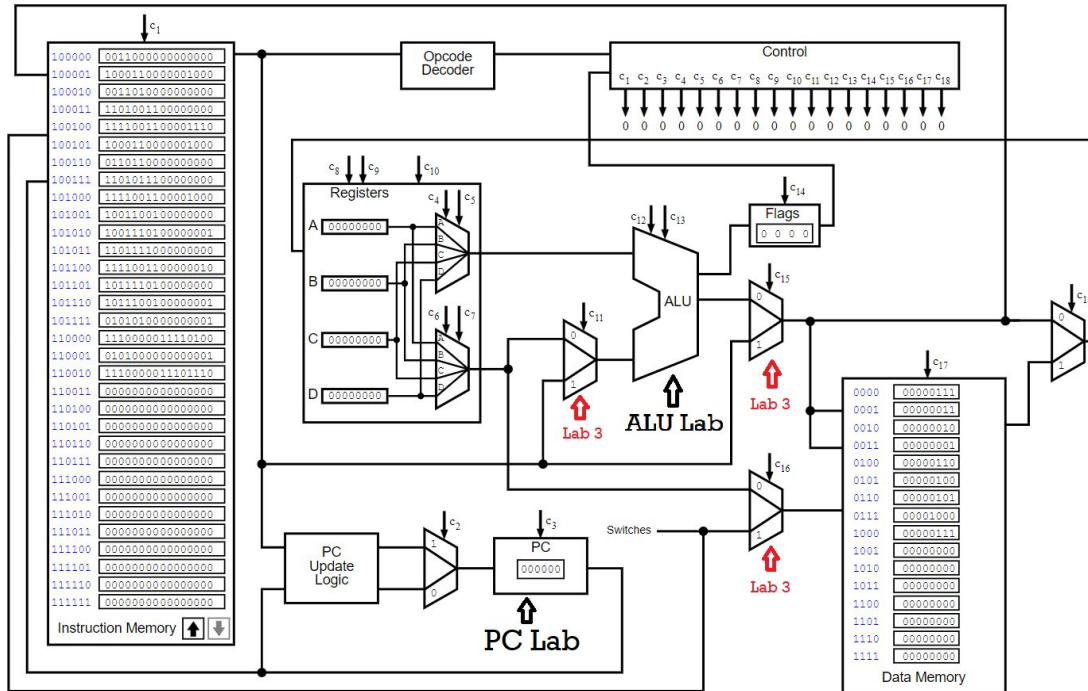Professor Alexander Stoytchev

Project Overview

- Utilize the existing i281e CPU designed by previous senior design teams.
- Assemble parts for another microprocessor and document the process.
- Design, test, and document 10 lab activities for a new class.
- Create and implement several outreach activities.
- Problem Statement - Design and implement a set of labs and activities based around the i281e CPU

Research i281 CPU

- Research i281e processor implementation
- Study slides
- Order Materials for Lab

Chips and Bread Lab

- Design Test Circuit and Basic circuit for lab
- Order parts for and build both circuits
- Develop material to teach about basic circuits and breadboards
- Test and document

Rock Paper Scissors

- Familiarize with i281 assembly language
- Develop RvPvS program in assembly
- Visualize on CPU with LEDs and buttons
- Test and document redacted version for labs

Mux Lab

- Design
- Order parts
- Build
- Test
- Document

PC Lab

- Design
- Order parts
- Build
- Test
- Document

ALU Labs

- Develop ideas for modifications
- Order Parts
- Build modified ALU
- Test and document

KiCad Lab

- Develop Requirements
- Design
- Build or Implement
- Test
- Document

EPROM Labs

- Research EPROMs and EPROM programming
- Program clock and 7-segment display
- Order parts and program the EPROMs
- Test and document

Detailed Design and Visuals

Lab 1: Implementing Digital Logic

Lab 3: Multiplexer

Lab 5: Program Counter

Lab 8: Registers

Lab 9: ALU

Functionality

- The i281e processor is intended for students who what to fill the knowledge gap after taking CPRE 281, 288 and 381

- The user is required to complete labs

- The system would respond by outputting LEDs or other testing methods to check that our labs work

Technology Considerations

Hardware

Chips:

- Some chips used in existing design are no longer produced so we needed to find a comparable solution
- The chip we decided on the AT28C256

Wiring:

- The lab room for the class does not allow for cutting wires
- Wire kits have limited lengths and colors
- The PC lab will require a lot of wires, more colors makes the circuits easier to follow

Simulator

- Need visual representations of for the labs with either photos or a simulator
- Needed to keep in mind cost, component availability, and ease of use

Currently using TinkerCAD since it's free, has a wide range of components and neatly depicts breadboards.

Areas of Concern and Development

- The current design can satisfy the needs due to supplementing our labs to further the user's education
- One of our concerns is that our labs may be a bit too advanced for some users, like middle schoolers, in the sense of delivering the lab material and ending up with a lower than expected success rate for the labs.

Conclusion

- Our labs will be sufficient to deliver our students during outreach events
- Our labs consist of a mix of digital logic focused labs and hardware focused labs
- Some constraints may be due to measuring lab success rate

Questions?