# COMPUTER SYSTEMS AND ORGANIZATION Part 1

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- 1. Goals
- 2. Communication & Office Hours
- 3. Enrollment and Grading
- 4. Lectures
- 5. Labs
- 6. Homework
- 7. Exams

Bonus (Map of things we'll cover)

#### **GOALS**

Students should be able to reason from first principles about the programs they write. For example, students should be able to answer the following questions about the C program below.

```
#include <stdio.h>
int main() {
    printf("Hello, World!");
    return 0;
}
```

- Why is the stdio.h file needed? How does its associated code get added to the final binary?
- What binary is generated when the program is compiled? What instruction does the binary implement?
- How does the CPU execute these instructions? What components are needed? How are they designed
- How can the program be optimized? Can we execute it with fewer assembly instructions (a smaller binary)?



## **COMMUNICATION & OFFICE HOURS**

#### Email:

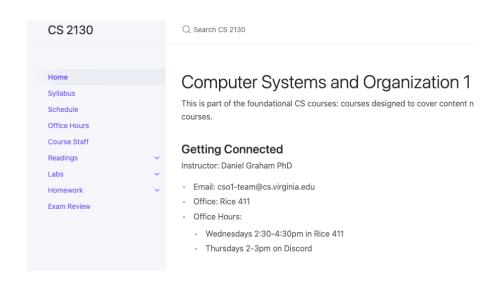
- DO NOT email me.
- Instead, email <u>cs2130@cshelpdesk.atlassian.net</u>
  - This email goes to a ticketing system where the TAs, GTAs, and I can see your request.
    - Eg. Need to schedule an alternative exam time, email this list.



#### **COMMUNICATION OFFICE HOURS**

#### Course Website:

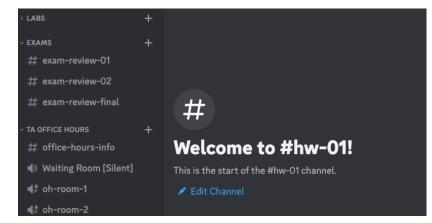
- https://researcher111.github.io/uva-cso1-F23-DG/
- Take 1 minute to visit the site. (you'll need it up for the next slide)
- The course website contains.
  - Course Schedule
  - Syllabus
  - Office Hours (Calendar)
  - Office Hours Queue
  - Labs
  - Homework
  - Past Exams
  - Course Staff Directory.



## **COMMUNICATION AND OFFICE HOURS**

#### Discord:

- We'll use Discord as our communication forum.
   We will NOT use Piazza
- If you have questions about the labs ask them on Discord.
- If you have questions about homework ask them Discord.
- Feel free to meet with your classmates on Discord and discuss homework and labs. Discord study groups are OK.
- Some TAs will have office hours on Discord.
- Keep your post in the relevant channel. Example:
   Talk about homework 1 in the hw-01 channel



Click the link in top write hand side of website to join discord
Student\_fistname Lastname (compid)



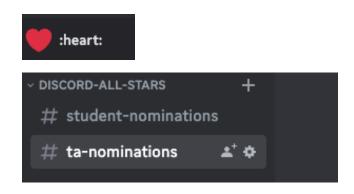
Q Search CS 2130

Canvas Dis

## **COMMUNICATION AND OFFICE HOURS**

#### Discord All-Stars.

- 10% Extra credit will be awarded to the top 10 most helpful students on Discord.
- Student nominates their fellow students by adding the student's name to the student nomination channel.
- Students can then vote for another student by adding a heart emoji to the nominations.
- Students can also nominate all-star TAs in the TA nomination channel.



#### **ENROLLMENT AND GRADING**

We will use Canvas as our learning management system.

- Check to see if you can access the course on Canvas. If not, email:
  - cs2130@cshelpdesk.atlassian.net
- ☐ The Grade book will be available in Canvas at the end of the semester.
- You can also find links to the course website on Canvas





#### **ENROLLMENT AND GRADING**

Grade a split roughly equally between exams and assessments. Homework and labs account for 54% of the grade, while all three exams account for 46% of the grade.

Task	Weight
Homework	40%
Lab	14%
Exams	15% Each
Final Exam	16%

#### **LECTURES**

- All lectures will be recorded and available (via the course site).
- Lectures will be approximately 35 minutes.
- At the end of each lecture, we'll look at a past exam question or a new sample question. You will get 5 minutes to work on the question (feel to talk to your classmates) and then, we'll go over the solution. Leaving time for questions.
- All lecture slides will be made available on the course website. Old lecture slides will remain on the course site until they are replaced by newer slides.



#### **LABS**

- **DON'T** drop your lab section to try to change labs; you might not be able to get back into the course. I believe SIS has a feature that allows you to switch sections.
- Labs will be in Olson 018.
  - You'll need to bring your own laptop to the lab.
  - Engineers need to work in teams. You need to learn to work in a team.
     Therefore, you need to attend labs. You'll work in person that you sit next to at the begin of the first lab and you'll rotate partners after each exam.
  - The TAs will take attendance at the end of the lab.
    - Don't be late for lab
    - Late lab attendance will be considered absence.

Task	Weight
Attend Lab	70%
Submit Files	10%
Pass test cases	20%

#### **HOMEWORK**

- Submit your homework to Gradescope for auto-grading. Submit your homework early, you want to give yourself enough time to pass the test cases.
- Gradescope will display your grade at the end of the assignment period. Grades from Gradescope will be moved to Canvas at the end of the semester.
- Work on the homework by yourself, but free to ask questions to your fellow students on Discord or during TA office hours.
- Due on Monday, No Late homework is accepted



## CS 2130 DEDICATED OFFICE HOURS

Day:	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Location:	Homework Due	Lab Day	Olsson 001				
5-6pm	Homework Due	Lab Day	Ben Yeh	Devang Ray	Dhriti	Justin	Nathan
	Homework Due	Lab Day	Luci	Yingming	Srikar	Jackson	
	Homework Due	Lab Day	Devang Ray	Нао	Shreepa	Tao	
	Homework Due	Lab Day	Vincent Song	Vincent Song	Aaryan		
	Homework Due	Lab Day	Feyona Zhang	Feyona Zhang	Srilakshmi		
	Homework Due	Lab Day	Nicolo Schianchi	Lilli Hrncir	Justin		
6-7pm	Homework Due	Lab Day	Ben Yeh	Devang Ray	Dhriti	Justin	Nathan
	Homework Due	Lab Day	Luci	Anika Malhotra	Srikar	Jackson	
	Homework Due	Lab Day	Devang Ray	Yingming	Shreepa	Tao	
	Homework Due	Lab Day	Anika Malhotra	Нао	Aaryan		
	Homework Due	Lab Day	Vincent Song	Vincent Song	Srilakshmi		
	Homework Due	Lab Day	Feyona Zhang	Feyona Zhang	Justin		
7-8pm	Homework Due	Lab Day	Lilli Hrncir	Anika Malhotra	Dhriti	Jackson	Nathan
	Homework Due	Lab Day			Srikar	Lilli Hrncir	
	Homework Due	Lab Day			Shreepa		
	Homework Due	Lab Day			Aaryan		
	Homework Due	Lab Day			Srilakshmi		



# CS 2130 DEDICATED OFFICE HOURS



#### **EXAMS**

- Exams will be in-class
- You can find the exam dates on the schedule of the website.
- Past exams are also available on the course website.
- The lecture before each exam will be a review lecture. During this lecture, I'll go over exam questions that I didn't cover in any of the previous lectures.
- For the final exam see the schedules for the times for your section.
- Exams can be taken before but not after the scheduled exam date



# **QUESTIONS?**



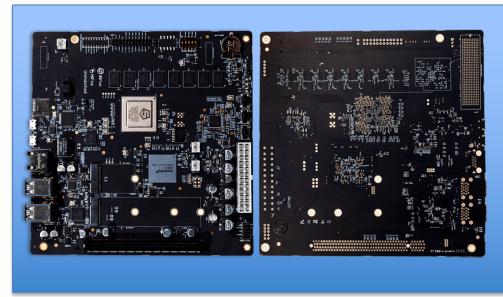
# LET'S TAKE MACHINE AND BREAK IT APART



Alibaba Roma RISC-V laptop



Alibaba Roma RISC-V laptop



HiFive Unmatched Risc-V development board



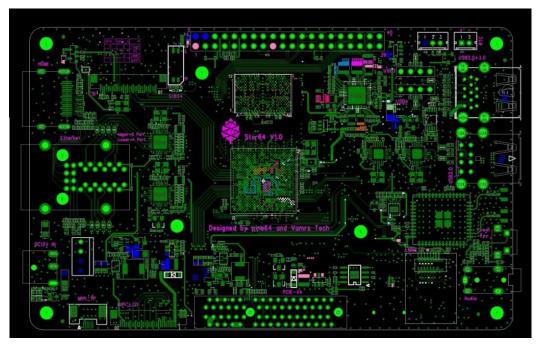
**HiFive Unmatched Risc-V** 

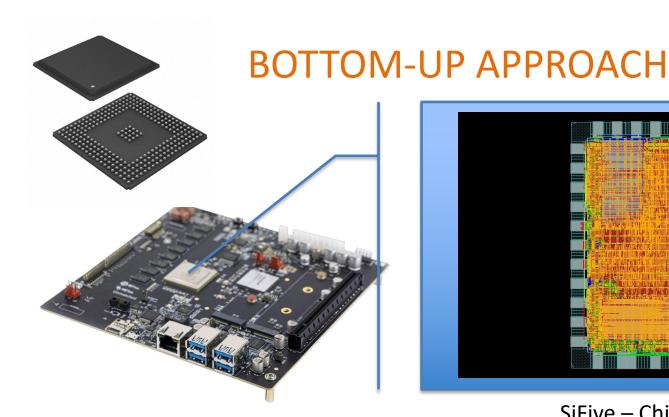


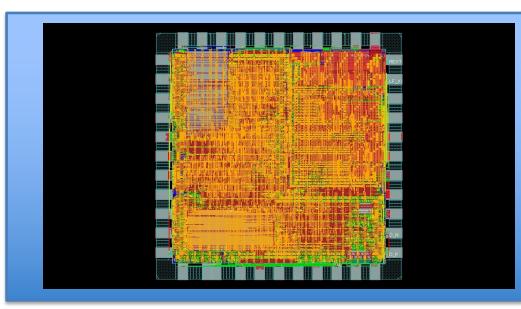
STAR64



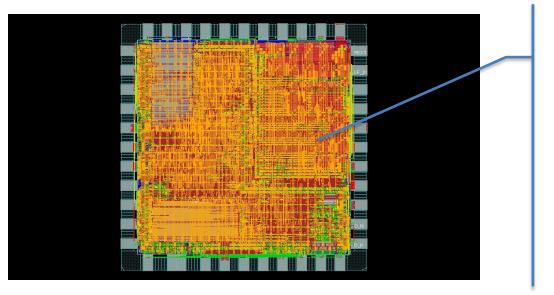


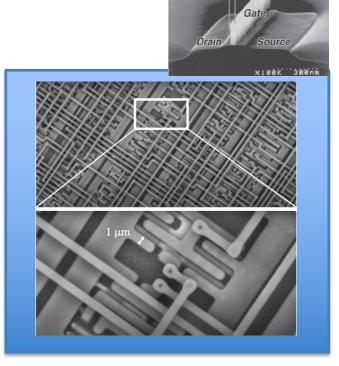


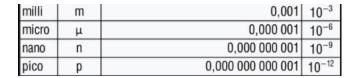


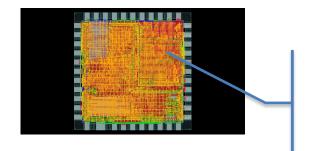


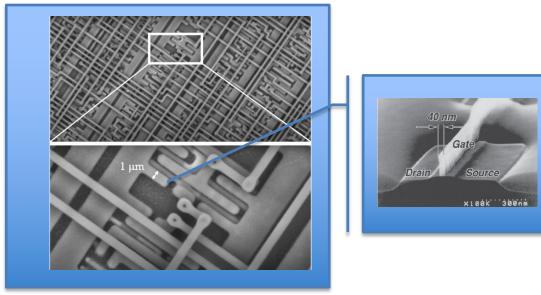
SiFive - Chip





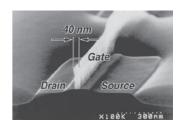


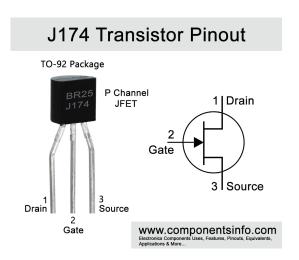




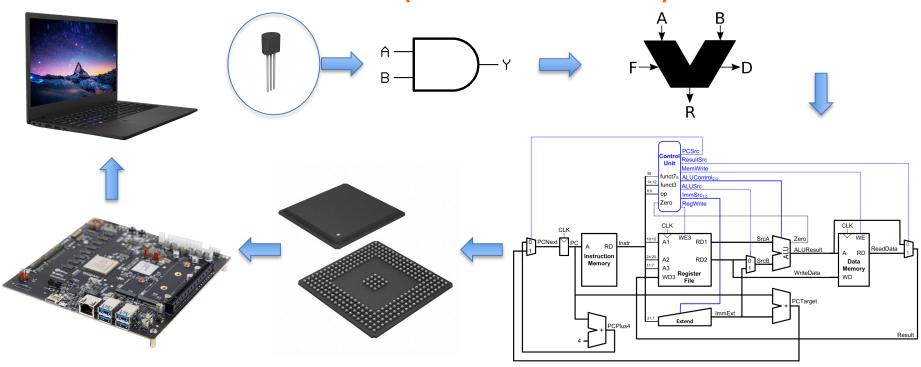
https://www.bbvaopenmind.com/en/technology/innovation/mini-transistors-technological-revolution-20th-century/

# THIS WERE WE'LL START OUR JOURNEY





# THE MAP (THE MACHINE)



https://github.com/MKrekker/SINGLE-CYCLE-RISC-V

# THE MAP (THE CODE)

```
#include <stdio.h>
int main() {
    printf("Hello, World!");
    return 0;
}
```

We will not cover this conversion in detail. CS 4620 - Compilers is a class dedicated to building and understanding the program designed to do this conversion.

```
0000000000001149 <main>:
    1149: f3 0f 1e fa
                                endbr64
    114d: 55
                                push
                                       %rbp
    114e: 48 89 e5
                                       %rsp,%rbp
                                mov
    1151: 48 8d 05 ac 0e 00 00
       0xeac(%rip),%rax
                                # 2004
lea
< IO stdin used+0x4>
    1158: 48 89 c7
                                       %rax,%rdi
                                mov
    115b: e8 f0 fe ff ff
                                call
                                       1050 <puts@plt>
    1160: b8 00 00 00 00
                                       $0x0,%eax
                                mov
    1165: 5d
                                       %rbp
                                pop
    1166: c3
                                ret
```

We'll focus on understanding the output of the program and how this output gets executed on a machine



# THE MAP (THE CODE)

```
0000000000001149 <main>:
    1149: f3 0f 1e fa
                                       endbr64
     114d: 55
                                       push
                                               %rbp
    114e: 48 89 e5
                                               %rsp,%rbp
                                       mov
     1151: 48 8d 05 ac 0e 00 00
        0xeac(%rip),%rax
lea
                                       # 2004
<_I0_stdin_used+0x4>
     1158: 48 89 c7
                                               %rax,%rdi
                                       mov
                                       call
                                                1050 <puts@plt>
    115b: e8 f0 fe ff ff
     1160: b8 00 00 00 00
                                                $0x0,%eax
                                       mov
    1165: 5d
                                               %rbp
                                       pop
     1166: c3
                                       ret
                                                                                            funct75
                                                                                               ALUControl-
                                                                                            funct3
                                                                                               ALUSrc
                                                                                               mmSrc.
                                                                                           Zero
                                                                                              WE3
                                                                                                                          ReadData
                                                                                 Instruction
                                                                                                 RD2
                                                                                                                      Data
                                                                                                                      Memory
                                                                                            WD3 Register
                                                                                                               WriteData
                                                                                                              PCTarget
                                                                                    PCPlus4
                                                                                                                              Result
```

# QUESTIONS WE'LL ANSWERS

What is a **Logic Gate** and how can transistors be combined to create one?

Why are logic gates useful? How can how could you build one?

How can logic gates be combined to create a circuit that does computation

How can programs be run on a logic circuit?

How can we make it easier to write programs for these circuits?



