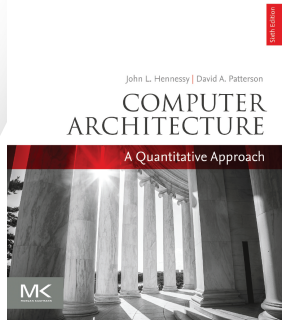


Computer Architecture

Chang Rui

Room 605, Cao Guangbiao Sci-tech Building
crix1021@zju.edu.cn
<https://person.zju.edu.cn/changrui>
TA: Lin Xi, Li Chenxiao

2025.02.18





Before the Class

Talk about this course

- Which hardware courses did you complete?



Talk about this course

- Which hardware courses did you complete?
- Which software courses did you complete?



Talk about this course

- Which hardware courses did you complete?
- Which software courses did you complete?
- How the hardware influence the software or program?



Talk about this course

- Which hardware courses did you complete?
- Which software courses did you complete?
- How the hardware influence the software or program?
- What will be covered in this course and what you can get from this course?



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- Which hardware courses did you complete?
- Which software courses did you complete?
- How the hardware influence the software or program?
- What will be covered in this course and what you can get from this course?
 - Understand the working principles of Computer.



Talk about this course

- Which hardware courses did you complete?
- Which software courses did you complete?
- How the hardware influence the software or program?
- What will be covered in this course and what you can get from this course?
 - Understand the working principles of Computer.
 - Know not only what but also why.



Talk about this course

- Which hardware courses did you complete?
- Which software courses did you complete?
- How the hardware influence the software or program?
- What will be covered in this course and what you can get from this course?
 - Understand the working principles of Computer.
 - Know not only what but also why.
 - Explore the tradeoffs of different designs and ideas.





Prepare for the Class

What's More

How I Prepared before the class.

- Textbook(Computer Architecture: A Quantitative Approach 6th edition)



What's More

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- Textbook(Computer Architecture: A Quantitative Approach 6th edition)
- Course Website (<https://courses.zju.edu.cn/course/80386/>)



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- Teaching Components
 - Lectures
 - Projects
 - Research



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 - Lectures
 - Projects
 - Research
- About me



Me

Rui Chang

- Associate Professor, College of CS, ZJU



Me

Rui Chang

- Associate Professor, College of CS, ZJU
- Research Interests:
 - System security
 - Architecture Security: ARM/RISC-V
 - OS Security: Linux/Android
 - TEE, Hypervisor-based, Hardware-assisted...
 - Formal method
 - Program analysis: Fuzzing, Symbolic execution
 - Formal verification: Theorem Proof, Model checking



Me

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 - Formal method
 - Program analysis: Fuzzing, Symbolic execution
 - Formal verification: Theorem Proof, Model checking
- My website (<https://person.zju.edu.cn/changrui>)



How will I teach?

My style (according to the course content and the learners)

- Keep it simple and clear



How will I teach?

My style (according to the course content and the learners)

- Keep it simple and clear
- Focus on the core concepts



How will I teach?

My style (according to the course content and the learners)

- Keep it simple and clear
- Focus on the core concepts
- Try to help you more easily understand



How will I teach?

My style (according to the course content and the learners)

- Keep it simple and clear
- Focus on the core concepts
- Try to help you more easily understand
- More concerns about security
 - CPU vulnerability
 - Memory attack
 - System security



How will I teach?

My style (according to the course content and the learners)

- Keep it simple and clear
- Focus on the core concepts
- Try to help you more easily understand
- More concerns about security
 - CPU vulnerability
 - Memory attack
 - System security
- Warm-up for research



You

Some suggestions for you.

- (some part of) Computer Architecture: A Quantitative Approach



You

Some suggestions for you.

- (some part of) Computer Architecture: A Quantitative Approach
- Why this book?
 - John L. Hennessy
 - David A. Patterson



You

Some suggestions for you.

- (some part of) Computer Architecture: A Quantitative Approach
- Why this book?
 - John L. Hennessy
 - David A. Patterson
- Other ways
 - from me (lectures/labs/projects)
 - from github (<https://github.com/riscv/riscv-isa-manual>)
 - doing by yourself (of course, discussion with others)
 - optional extension



You should know:

Scoring

- Final examination—40%, 40 points



You should know:

Scoring

- Final examination–40%, 40 points
- Process assessment–60%, 60 points
 - Homework–6 points
 - Class Attendance/Presentation–6 points



You should know:

Scoring

- Final examination–40%, 40 points
- Process assessment–60%, 60 points
 - Homework–6 points
 - Class Attendance/Presentation–6 points
 - Projects–48 points
 - Forwarding+Pipeline –8 points
 - Interrupt exception –8 points
 - Branch prediction –8 points
 - Cache design –10 points
 - Out-of-order execution –14 points



You should know:

Important note

- Homework/Labs need to be submitted in time.



You should know:

Important note

- Homework/Labs need to be submitted in time.
- The more Late the more discount.



You should know:

Important note

- Homework/Labs need to be submitted in time.
- The more Late the more discount.
- Any new try is strongly encouraged.



How will you contribute?

Thanks in advance.

- Know the real architecture
 - according to reading, thinking, discussion and doing
 - show your lab/project demo
 - literature reading about recent research



How will you contribute?

Thanks in advance.

- Know the real architecture
 - according to reading, thinking, discussion and doing
 - show your lab/project demo
 - literature reading about recent research
- AT LEAST
 - submit assignments & lab reports
 - show up to final exam





Begin the Class

Contents

1. Fundamentals of computer design (Ch1)----- 4 class hours
2. Pipelining (AppA, AppB)----- 6 class hours
3. Memory Hierarchy (AppC and Ch2)-----10 class hours
4. ILP (Ch3)-----15 class hours
5. DLP and TLP (Ch4 and Ch5)-----5 class hours



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