CS-428 Concurrent & Distributed Systems

2014, 2015, **Spring 2021**

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Syllabus

About the Course

Learning Outcomes

CLO1	Have a good understanding of concurrent and distributed systems
CLO2	Be able to write programs for Concurrent systems
CLO3	Be able to write programs for Distributed systems
CLO4	Be able to write programs for specialized Performance Hardwares

Marks Breakdown

- Sessional I: 15%
- Sessional II: 15%
- Final Examination: 50%
- Assignments: 20% (including Takehome Lab Activities)

About the Course (cont.)

Assignment Instructions

- Will accept assignments after last date, provided said assignment for entire class is not marked.
- Parts of assignment may appear in examinations. If not, then similarity checks may be applied on submitted assignments.

- HPC Setup with support for various parallel and distributed computing frameworks will be made available to all students for duration of semester (and beyond upon request)

Generating Public Key for Assignments

- On Windows, Use https://winscp.net/eng/docs/ui_puttygen
- On Linux, use **ssh-keygen** command
- Share generated key with me by email.

About the Course (cont.)

Probability Distribution of Previous Grades

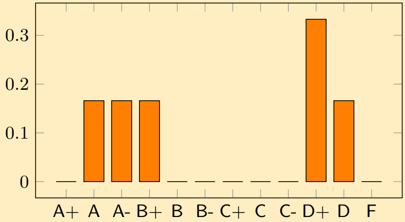

Figure 1: Spring 2014

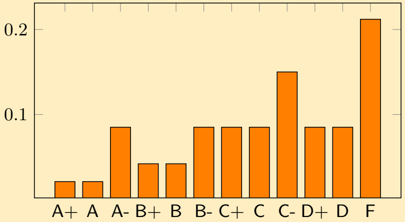

Figure 2: Spring 2015

Where are We

- Clock rates 40 MHz (MIPS R3000 1988) $\rightarrow$ 4.0 GHz (Intel Core-i7-4790K 2015), 4.4 GHz (Intel Xeon X5698 2015)
- Higher processor speed $\propto$ More **heat dissipated**
- Transistor has reached size of 32 nm (Generation 3 Core-i7). **Size limit**: How much more smaller can it get?
- What is a single clock cycle worth?
  - **xchg**: Exchange values in two registers
  - **push**: Push operation using registers
  - **pop**: Pop operation using registers
  - **add**,**sub**: 3 additions/subtractions involving registers
  - **cmp**: 3 comparisons involving registers
  - **mul**: half a fp multiplication involving registers
- Can we get a 8 GHz clock frequency?
- What will happen if we reach a 8 GHz clock frequency?
- Support for executing multiple instructions per clock cycle, fast cache technologies, superscalar architectures ...
- Dramatic increase in Floating Point Operations per Second (FLOPs)

Where are We (cont.)

Figure 3: AMD breaks Guinness World Record for fastest processor frequency at 8.429 gigahertz (2011)

Where are We (cont.)

A question to think about

- Akram has a 12 GHz single core processor. Akbar has a quad-core 3 GHz multiprocessor. Which one is faster?