



Computer Organization II

- Position
 - Advanced (MSc) level course (2005 degree requir.)
 - Intermediate (BSc) level course (2010 degree requir.)
- Prerequisite: Computer Organization I (TiTo)
 - Main hardware
 - Symbolic assembly language, machine instructions
 - CPU Instruction cycle
 - What happens in system during the cycle?

■ Related to Operating Systems

- Interrupts
- Virtual memory
- I/O Techniques

Computer Organization II, Autumn 2010, Teemu Kerola



Course Material

- Course book (Make sure you have one!)
 - Stallings W., Computer Organization & Architecture, Designing for Performance (8th ed), Prentice-Hall, 2010.
 - (7&6th ed.) possible, but MISSING a lot of material
- Lecture course home page (Autumn 2010) https://www.cs.helsinki.fi/en/courses/581365/2010/s/k/1
 - Schedule, slides, exercises, announcements, links, etc.
- Course home page

http://www.cs.helsinki.fi/group/nodes/kurssit/tikra/

- Old courses, slides in Finnish and English, etc.
- Later: https://www.cs.helsinki.fi/en/courses/581365/ ?

Computer Organization II, Autumn 2010, Teemu Kerola

8.10.2010



Schedule Autumn 2010

- Lectures: 2.11. 9.12.2010
 - Tue and Thu 14-16 (D122), Teemu Kerola
 - In English when needed

■ Practice sessions:

- Thu 14-16 (D122), Teemu Kerola
- General discussion in English
- Table discussion in Finnish (if everyone understands)

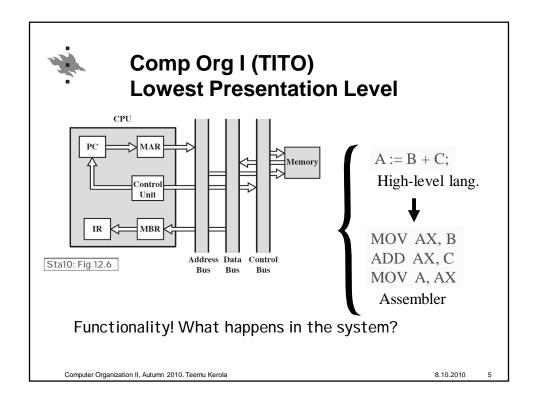
■ Course Exam

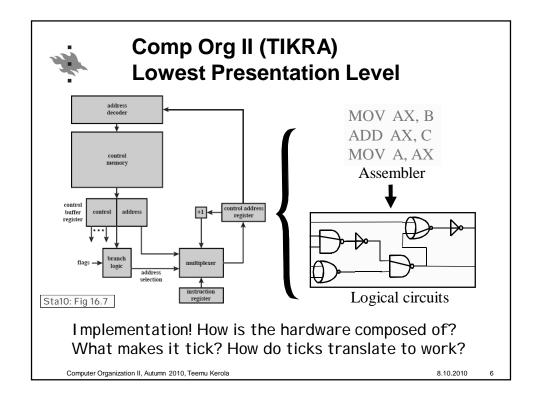
- Tue 14.12.2010, 9-12 (A111)
- Tue 25.1.2011, 16-20 (A111), make-up exam/final exam
- All exams also in English, if requested in advance

Computer Organization II, Autumn 2010, Teemu Kerola

8.10.2010

4







Learning goals

■ Digital logic: Combinatorial & Sequential Circuits

■ Bus: multiplexing, signaling

■ Memory hierarchy: cache, TLB

■ **Arithmetics**: Booth algorithm, representations

■ Instruction set: operands, operations, memory reference

Processor structure and functions: pipelining, RISC,CISC

■ **Control**: micro-operations, micro-programmed control, clock pulse

■ Parallel Processing: types, cache coherence, multicore

More detailed learning goals are available from course page

Computer Organization II, Autumn 2010, Teemu Kerola

R 10 2010



Course contents and schedule

- Week 1
 - Overview (Ch 1 8)
 - Digital logic (online Ch 20)
 - Bus (Ch 3)
- Week 2
 - Memory, Cache (Ch 4, 5)
 - Virtual memory (Ch 8.3-8.6)
- Week 3
 - Computer arithmetic (Ch 9)
 - Instruction sets (Ch 10, 11)

- Week 4
 - CPU struct. & func. (Ch 12)
 - RISC-architecture (Ch 13)
- Week 5
 - Instruction-level parallelism, Superscalar proc. (Ch 14)
 - Control Unit (Ch 15-16)
- Week 6
 - Parallel Processing (Ch 17)
 - Multicore (Ch 18)
 - Summary

Computer Organization II, Autumn 2010, Teemu Kerola



Work during the course

- Combine the details together to form a larger picture
 - Try to continuously understand and analyse the connections
 - Stay awake!

■ Make notes

Write down own ideas and questions immediately

■ Ask questions

- Question are never too simple.
 (If you missed the point, then somebody else missed it also)
- Ask from teachers but also from co-students.
- Teamwork is allowed even with individual assignments
 - However, own paper must be written by you, even if you co-operated in learning the content

Computer Organization II, Autumn 2010, Teemu Kerola

8.10.2010



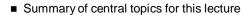
Summary lectures



All lectures are summary lectures

- Slides are just the "table of content" for summary lectures
- Students are expected to have studied lecture topic in advance
 - Read given chapters from the text book!

Lecture consists of





- Small group discussions on given topics
- General discussions, based on small group discussions and student questions

Computer Organization II, Autumn 2010, Teemu Kerola



Practice Sessions

- Mark down homeworks done
 - Grade points based on marked homeworks and attendance
- Split into tables
 - Some tables in English
- Discuss all problems in each table

Computer Organization II Ask questions if needed

8.10.2010 111111



Projects

- All volunteer with extra projects
- Project 1: Make 2 new practice problems
 - Team project, 1-4 students
 - Understand some topics better
- Project 2: Study diary
 - Can work with a team
 - Each student will turn in their own diary
 - 1st part turned in already after 3 weeks
 - Understand all topics better

Computer Organization II, Autumn 2010, Teemu Kerola

8.10.2010 121212



Grading

Course Component	Available points toward grade	Minimum points needed to pass
Practice Sessions (homeworks, attendance)	6	1
Course Exam	30	15
Extra Projects	6	0
Total	42	18

Computer Organization II, Autumn 2010, Teemu Kerola

8.10.2010 131313



How much time do I need to invest for this course?

- Simple time estimations (for planning)
 - VERY OLD: 6,5 weeks*(2*(4+2) h/wk) = **78 h**
 - OLD: 4 cu = 2 study weeks: 2 * 40 h = **80 h**
 - CURRENT: 1 year / 60 cu = 1600 h / 60 cu = 26.67 h / 1 cu = **107 hours** / 4 cu

■ Motto:

"It is not good exercise, if you do not sweat" ("Kunto ei nouse, ellei tule hiki.")

Enjoy the course!

Computer Organization II, Autumn 2010, Teemu Kerola



Credits

- Teemu Kerola 1999-2003
 - Original slides (in English), Based on 5th edition
 - Updated to 6th edition 2002
- Auvo Häkkinen 2004-2005
 - Most slides translated to Finnish, orange layout
 - Updated to 7th edition 2005
- Teemu Kerola 2006
- Liisa Marttinen 2007
- Tiina Niklander 2008-2010
 - 2009: Translation to English from the Finnish slide set
 - 2010: Updated most slides to 8th edition

Computer Organization II, Autumn 2010, Teemu Kerola

8.10.2010

15