

Lecture 1 Intro

Moore's law and Dennard scaling

- [y2010p5q2 \(a,b\)](#)
- [y2021p5q1 \(a,b\)](#)
 - Explores technology scaling and critical paths.

Lecture 2 Digital system design

Part 1A Digital Electronics, ECAD practicals, Reading and writing SystemVerilog

- [y2020p5q1](#)
 - Moore's law, wire scaling, timing analysis and some SystemVerilog.
- [y2019p5q1](#)
 - Conditional operators
 - sequential vs. continuous assignment, resets and synchronisation in SystemVerilog.
- [y2018p5q1](#)
 - Assignment operations
 - statement ordering in SystemVerilog
- [y2017p5q1](#)
 - State transitions.
- [y2016p5q1](#)
 - Bugs finding
- [y2015p5q1](#)
 - what high-level operation the low-level state machine performs.
- [y2011p5q1](#)

Lecture 3 Eight great ideas i

- [y2020p5q2 \(a-b\)](#)
 - making the common case fast, see more at Lecture 11

Moore's law

- See Lecture 1

Lecture 4 RISC-V ISA

- [y2021p5q1 \(c,d\)](#)
 - Explores calling conventions and RISC-V assembler.
- [y2014p5q2 \(a\)](#)

- subroutine call, hw and sw. preserved registers

Lecture 5 Five-step Executable

- [y2018p5q2](#)
 - RISC-V machine code format some and implications on pipelines.

Lecture 6 Pipeline

- [y2021p5q2\(a,b\)](#)
 - hazards, mitigations and their limitation
- [y2017p5q2](#)
 - Explores fallacies and pitfalls.
- [y2016p5q2](#), [y2007p6q2](#),

Lecture 8 Memory hierarchies (Cache)

- [y2020p5q2 \(c-g\)](#)
- [y2019p5q2](#)
- [y2009p5q3](#)
 - Write policies.
- [y2021p5q3](#)
 - with MSI
- [y2014p5q3](#)

Lecture 9 OS (hardware support)

- [y2015p5q2](#)
 - Memory hierarchy and memory protection
 - skip part (d), no longer covered
- [y2011p5q3](#)
 - Caches and TLBs
- [y2021p5q2\(c\)](#)
 - VM, hardware support

Interrupts/Exceptions

- [y2019p5q2 \(b\)](#)
- [y2014p5q2 \(b\)](#)
 - vs subroutine call

Lecture 10 Alternative ISA

From Cambridge's EDSAC through to today's CISC machines.

- [y2008p6q2](#)

- RISC, CISC and stack machines.
- [y2006p6q2](#)
 - register vs. stack machines; caches.

Lecture 11 SoC, DRAM

Flynn's taxonomy; Amdahl's and Gustafson's laws

- [y2016p5q3 \(a\)](#)
- [y2020p5q3 \(a,b\)](#)

DRAM

- [y2018p5q3 \(a\)](#)

Lecture 12 MSI

- [y2015p5q3 \(a\)](#)
- [y2017p5q3](#)
- [y2018p5q3 \(b\)](#)

Lecture 13 Memory consistency model (hardware support)

- [y2015p5q3 \(b\)](#)

Lecture 14 GPU

- [y2016p5q3 \(b\)](#)
- [y2019p5q3 \(d,f,e\)](#)

Lecture 15 CUDA, OpenCL

- [y2019p5q3 \(a,b,c\)](#)

Lecture 16 Future

- [y2020p5q3 \(c,d,e\)](#)