COM1006 Devices and Networks (Autumn)
COM1090 Computer Architectures

Lecture #0

Introduction

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How Computers Work

Overview of topics

- Digital systems
- Computer arithmetic
- Gates and logic
- Implementing logic
- Sequential circuits
- Instruction set architecture
- The structure of the CPU
- Assembly language programming
- Accelerating performance
- Computer memory

COM1006 Spring term: Computer networks (taught by Joab Winkler)

At the end of this module you should...

- understand the computer representation of integer and floating-point numbers
- know how to design functional units using combinatorial and sequential logic
- understand and be able to describe the components of a computer system
- understand and be able to write simple programs in assembly language
- understand how system performance can be accelerated by use of pipelining and cache memory

➔ **understand how computers work!**

Course material (on module web page)

- Much of the content covered by Alan Clements: Principles of Computer Hardware (available from library and amazon)
- Additional reading: M. Mano (1992) Computer system architecture
- Slides, exercises, etc. adapted from Clements book & Guy Brown
- Clean room excursion planned for Weeks 5-7 with support from Diamond staff (Gavin Williams and Ramsay Taylor)
- CPU designed in Logisim from elementary gates by former COM1006 student Richard Astwick

Why Software Engineers should care

- Foundations every Computer Scientist should know about
- Avoid pitfalls of binary arithmetic in computer programs:

```
2000000000 + 1000000000 = -1294967296

0.7 + 0.1 = 0.7999999999999999

1000000.0 + 0.00000000001 = 1000000.0
```

- Understand efficiency of computer programs
  - glimpse into efficiency of arithmetic/logical operations
  - how memory and caches work
  - experience low-level programming

Teaching

- Lectures
  - Wednesday 9:00-9:50, Diamond LT 5 and
    Friday 14:00-14:50, Diamond LT 2
  - Slides uploaded to Module web page after each lecture
- Tutorials/lab sessions (starting next week)
  - Thursday 15:00-15:50, Diamond, Room 201/Computer Room 1
  - Exercise sheets available from Monday 17:00
- MOLE quizzes (4 quizzes)
  - Friday 16:00-16:50, Diamond, Room 201/Computer Room 1
  - Only in Weeks 4, 6, 8, 10 (tentative dates)

Assessment

- MOLE quizzes: 30% of Autumn marks (7.5% each quiz)
  - increased from 20% in past years due to student feedback
  - COM1006: 30% of 50% = 15% of overall module mark
- Final exam: 70%/85% of module marks
  - COM1090:
    - 30-40 minutes oral exam around January (dates to be agreed)
  - COM1006:
    - written exam covering Autumn & Spring parts in May/June
    - 3 hours, answer 2+2 out of 3+3 questions
- Example exam paper on module web page

Expectations and tips for learning

- In class:
  - Attend lectures and participate
  - Take notes on handouts
- At home (library, etc.):
  - Recap slides/handouts after each lecture
  - Look up relevant literature (e.g. Clements)
- Come to lab sessions and do the exercises
- Engage in MOLE discussion boards
- Come to my office hours (Regent Court, room 150):
  - Fridays 15:00-16:00 (not this week, though)
  - or by appointment: d.sudholt@sheffield.ac.uk