3BA5 Computer Engineering

- Part I in Semester I
  - Microprocessor Systems Engineering
    - Lecturer: Michael Manzke
- Part II in Semester II
  - Parallel Systems and Parallel Algorithms Design
    - Lecturer: **Dr. Mc Carthy**

Lecturer (Semester I):

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www.cs.tcd.ie/Michael.Manzke/3ba5.html

Microprocessor Systems Engineering(Part 1)

- Course Aims
  - To acquire an understanding of computer architecture.
    - Behaviour
    - Design
  - From von Newman's single processor up to the highly parallel pipelined and multiprocessor systems in use today.

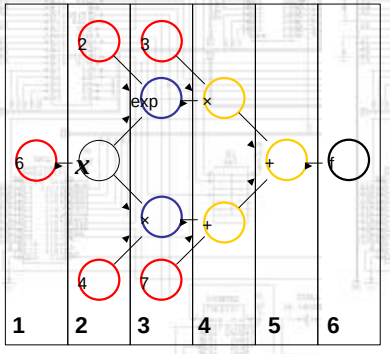
Course Overview for Part 1

- Duration:
  - Half year (9 +3 weeks).
- Number of Lectures per Week:
  - Two
- Number of Tutorials per Week:
  - One, but tutorials could be lectures or lab demos.

Course Overview (two)

- Software:
  - VHDL (XILINX - ISE Logic Design Tools)
  - Mentor Graphics, ModelSim
- Prerequisites:
  - Digital Logic (1BA4)
  - Electro technology (1BA5)
  - 68XXX Assembly Language Programming (1BA3)
  - Computer Architecture I (2BA4)

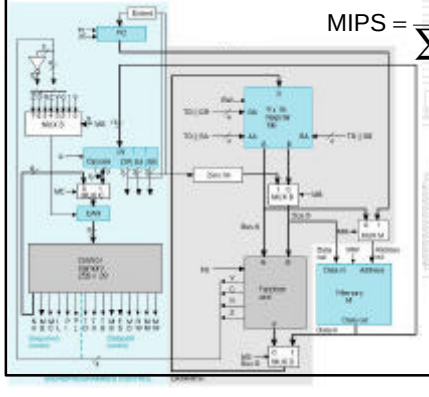
General Contents 1



- Fundamental Constrains
- Taxonomy of Computer Architecture

General Contents 2

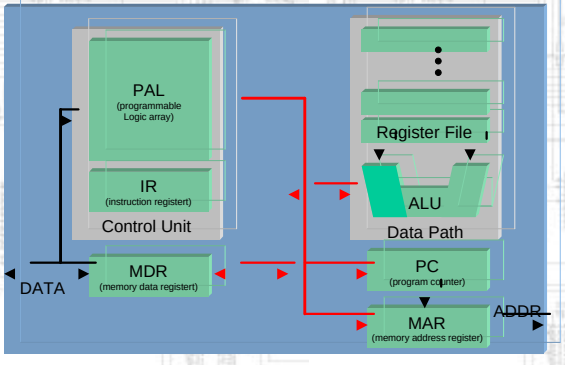
$$MIPS = \frac{1}{\sum (IF_i \times CPI_i \times t)} \times 1000$$



- Processor System Performance

General Contents 3

- Compute System Organisation



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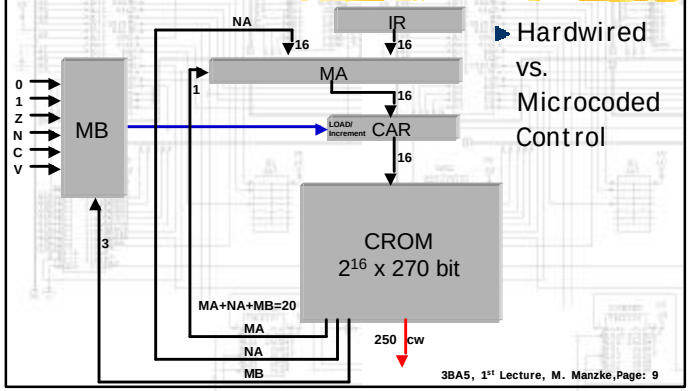
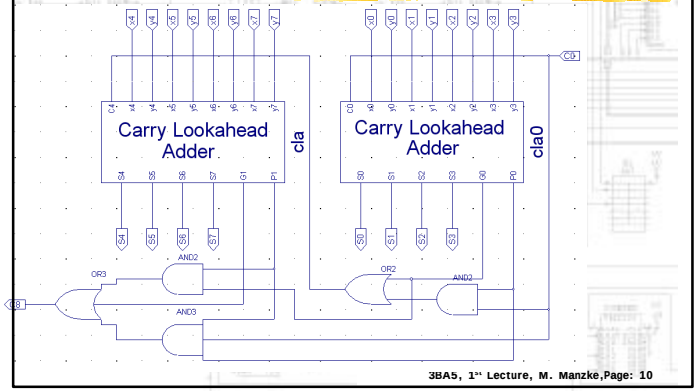


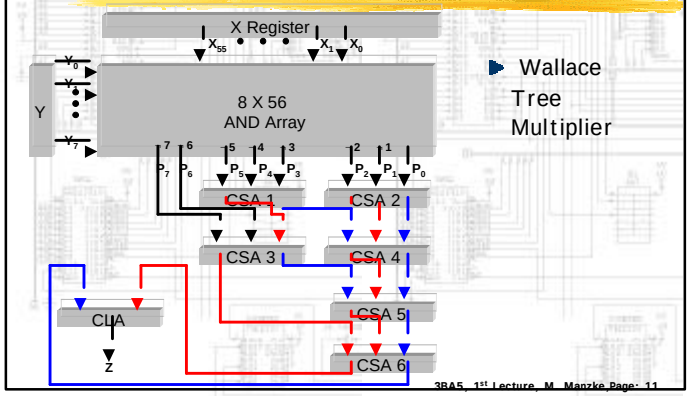
- Hardwired vs. Microcoded Control

General Contents 5

- ALU Design

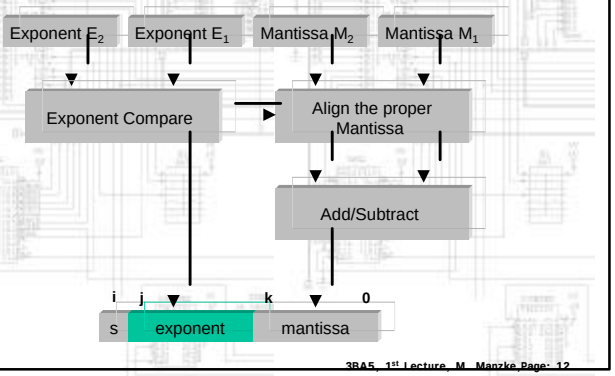


General Contents 6



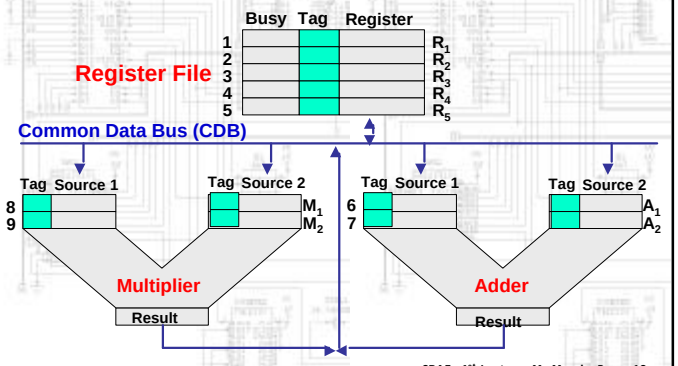
- Wallace Tree Multiplier

General Contents 7



General Contents 8

- Tomasulo's Method



Course Work (Semester 1)

- Two projects.
  - VHDL Floating-point pipeline
  - Computer Architecture Essay or VHDL project
- Coursework accounts for 20%

Course Requirements

- Pass 3BA5 ->
  - You must pass the Exam
- Pass the 3BA5 Exam ->
  - Exam Marks + Course Work >= 40%

3BA5 Exam

- 8 Questions
  - 4 Questions from semester 1:
    - Microprocessor Systems Engineering
  - 4 Questions from semester 2:
    - Parallel Systems and Parallel Algorithms Design
  - You must answer 5 questions
  - At least 2 from Part I and 2 from Part II

Useful Books

- M. Zargham "Computer Architecture – Single and Parallel Systems", Prentice Hall 1996.
- "Logic and Computer Design Fundamentals" 2nd Edition updated, Mano (includes Xilinx Student Edition 4.2i software)
- "Computer Organization and Design" second Edition, John Hennessy, David Patterson.
- "Computer Architecture – A Quantitative Approach", third Edition, John Hennessy, David Patterson.
- "Introductory VHDL: From Simulation to Synthesis"



Tutorial Sessions

- Used for:
  - VHDL work
- Takes place in LG35/36 or Lecture theater LB01