



Computer Systems and Professional Practice

Professor Matthew Leeke
School of Computer Science
University of Birmingham

Topic 1 - Introduction

Session Outline

Academic Aims

Administration

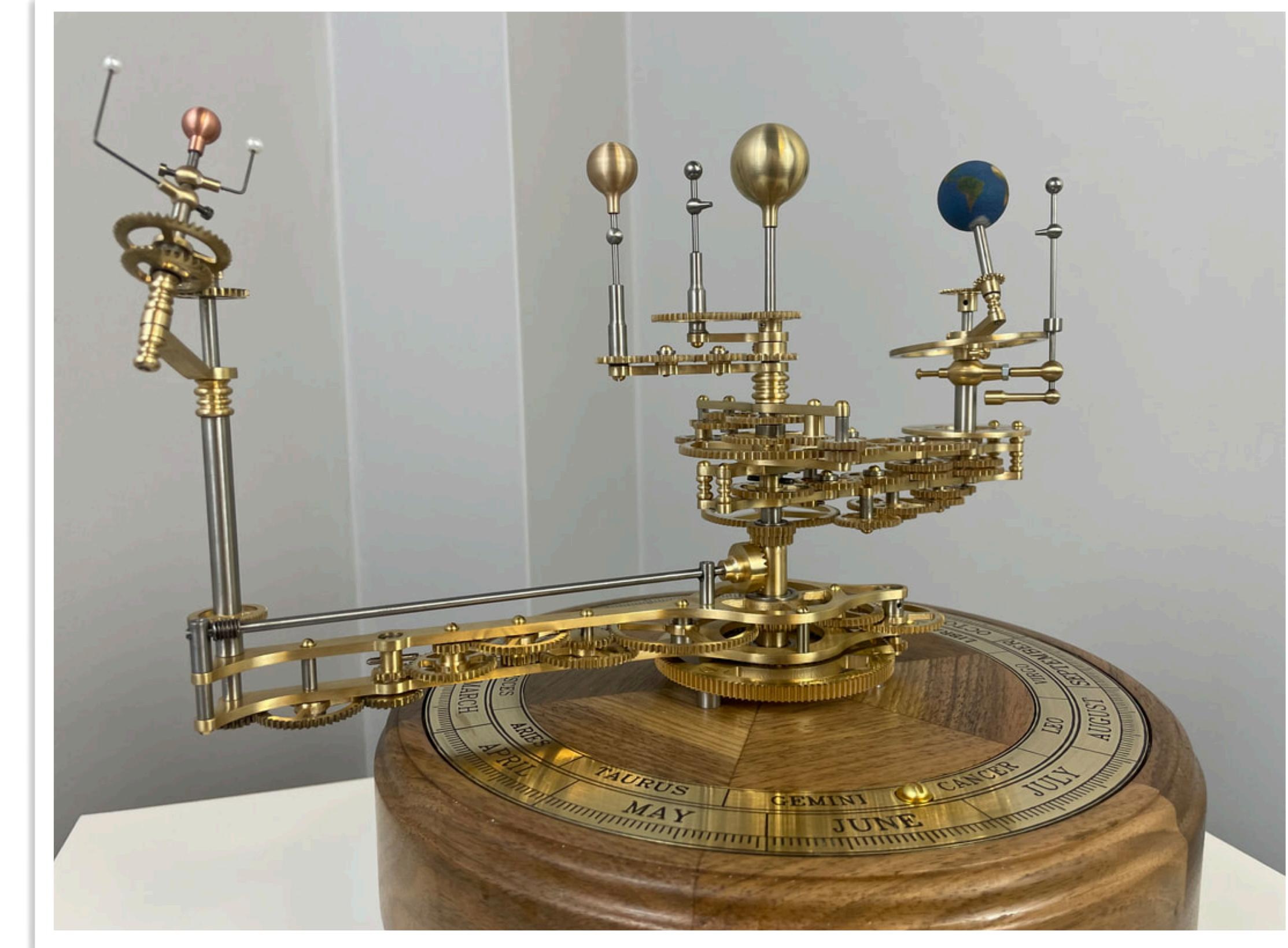
Assessment

Lecture Topics

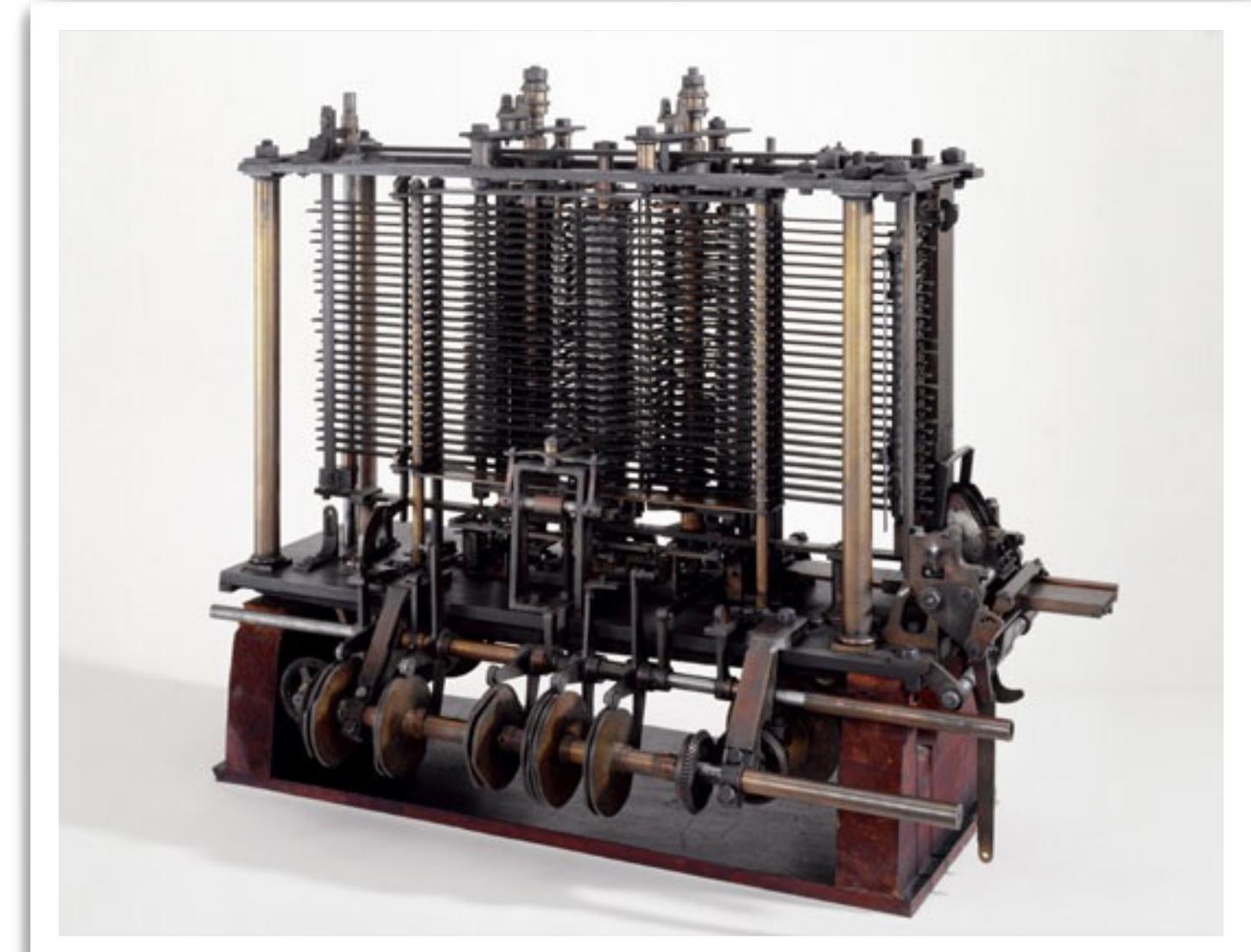
Recommended Books

Expectations

What is a Computer?



What is a Computer?



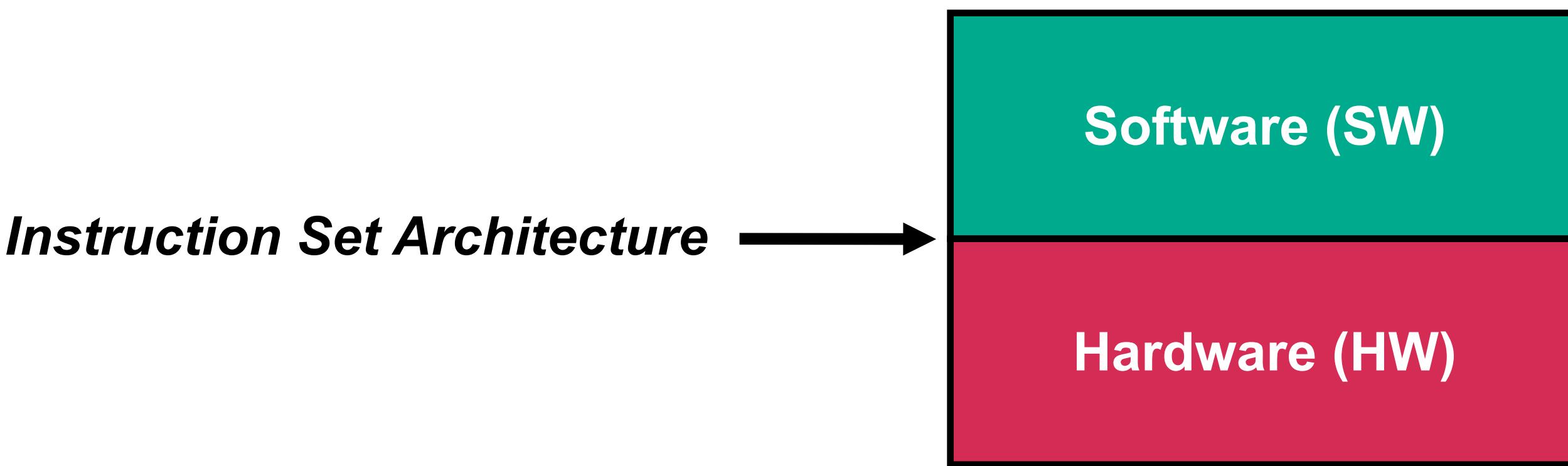
Module Aims

How do we define a computer?

How can we build a computer?

Computer architecture is fundamental

Design the layers of abstraction and the intervening interfaces



Module Administration

Module Organiser:

Matthew Leeke (CS 116, m.leeke@bham.ac.uk)

Niloofer Shanavas (n.shanavas@bham.ac.uk) [Dubai], Qamar Natsheh (q.natsheh@bham.ac.uk) [Dubai]

Module Lectures:

10am-11am on Wednesday (ARTS-Main LT) and 12-1pm on Wednesday (LAW-LT1 303), or 2-4pm on Friday (TLB-LG18). You will be allocated to the two hours on the Wednesday or the two hours on the Friday. You must attend only the two hours to which you are assigned.

Module Page:

<https://canvas.bham.ac.uk/courses/77845>

Module Assessment

The module is assessed by a examination (80%) and continuous assessment (20%)

Examination:

- Exclusively focused on computer systems topics

- Two-hour paper with three questions

- Takes place in the Main Examination Period

Continuous assessment:

- All details online - note the Thursday of Week 10, Term 1 submission deadline

Lecture Topics

1. Introduction
2. Data Representation
3. Digital Logic
4. Machine Code and Assembler
5. Memory Systems
6. I/O Mechanisms
7. Processor Architecture

Learning Outcomes

You should be able to:

Explain common data representations and their role in computer systems

Discuss the organisation and architecture of computer systems and their components, including logic components, microprocessors and I/O systems

Demonstrate basic systems programming and digital circuit prototyping abilities

Discuss a range of legal, social, ethical and professional issues relating to the design, implementation and deployment of computer systems

Write in an appropriate scientific style on aspects of computer systems and professional practice

Topic 1 - Introduction

Understand what we'll be doing in the module

Recognise that you'll need to exercise your professional practice in pursuit of computer systems

The module coursework requires independent study, beyond what you're likely to have experienced to this point

```
/* ADDR is a pointer to the byte  
   at location 0xc0000 */  
#define ADDR ( (volatile unsigned char *) 0xc0000 )  
  
unsigned char b;  
b = *ADDR; /* read from location 0xc0000  
               into variable b */  
*ADDR = 0x2A; /* write 42 into  
                  location 0xc0000 */
```

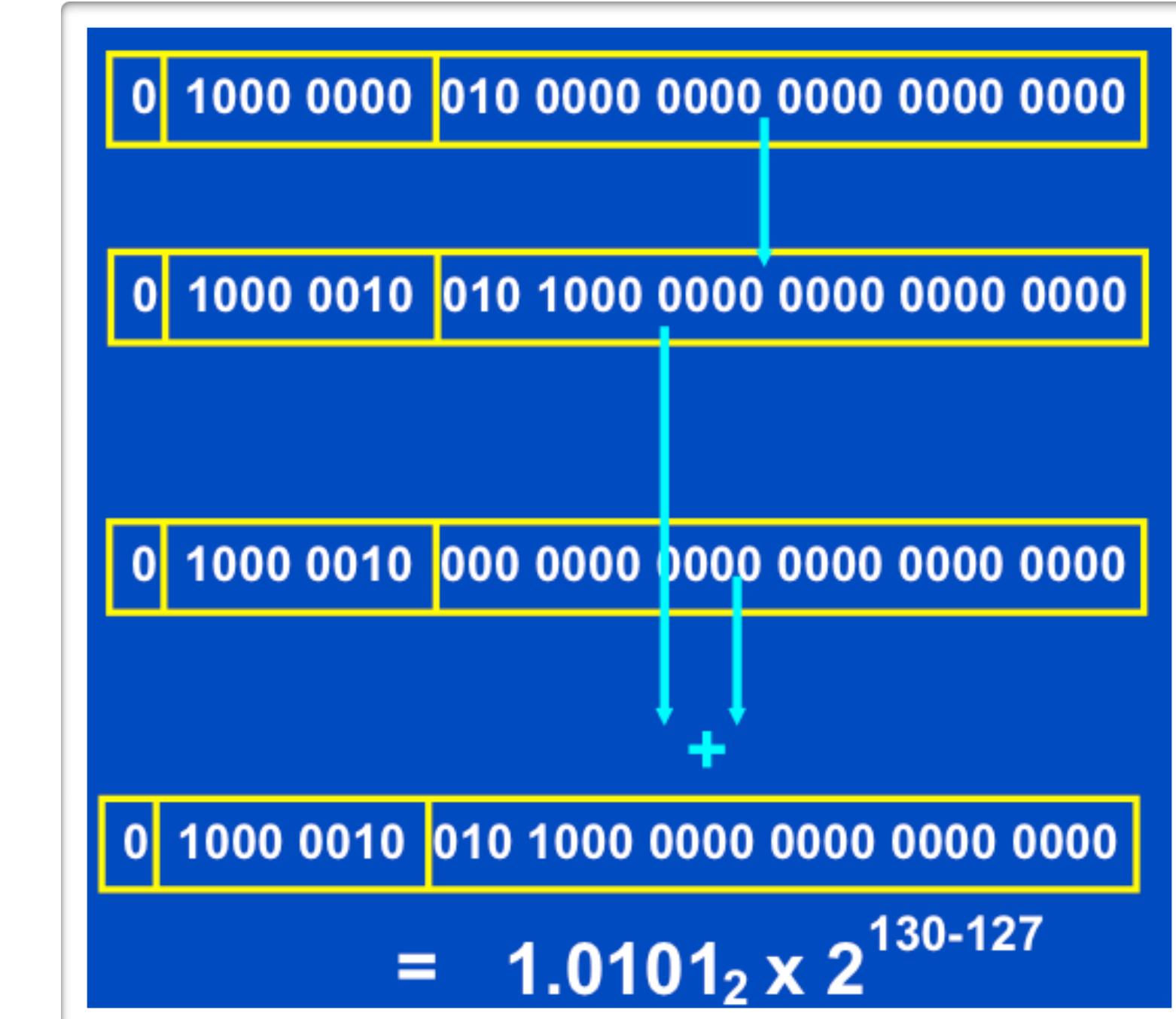
Topic 2 - Data Representation

We focus on representation as it relates to the encoding of numbers

Why numbers systems?

How can representations be manipulated to perform arithmetic operations

Why manipulate representation?

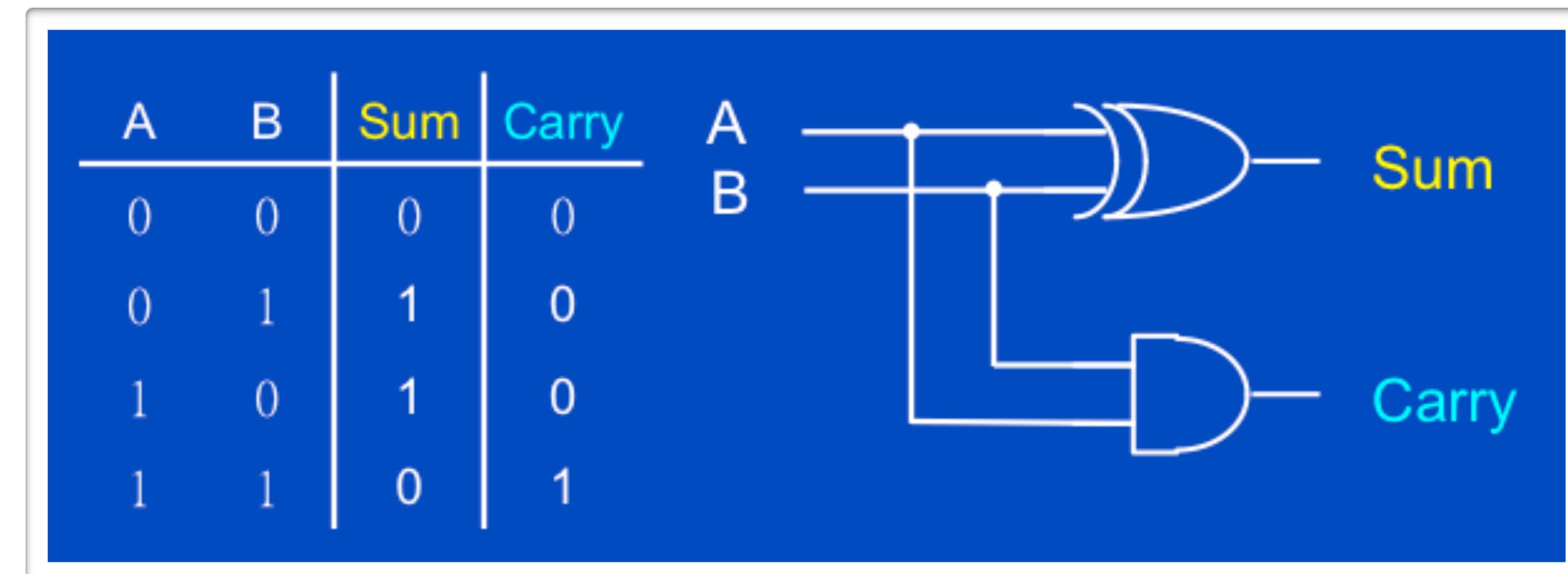


Topic 3 - Digital Logic

Logic gates and how logic circuits can be built from just a few elementary gates

Designing and constructing circuits for calculation / computation

How complicated logic functions can be simplified using Boolean algebra and Karnaugh maps



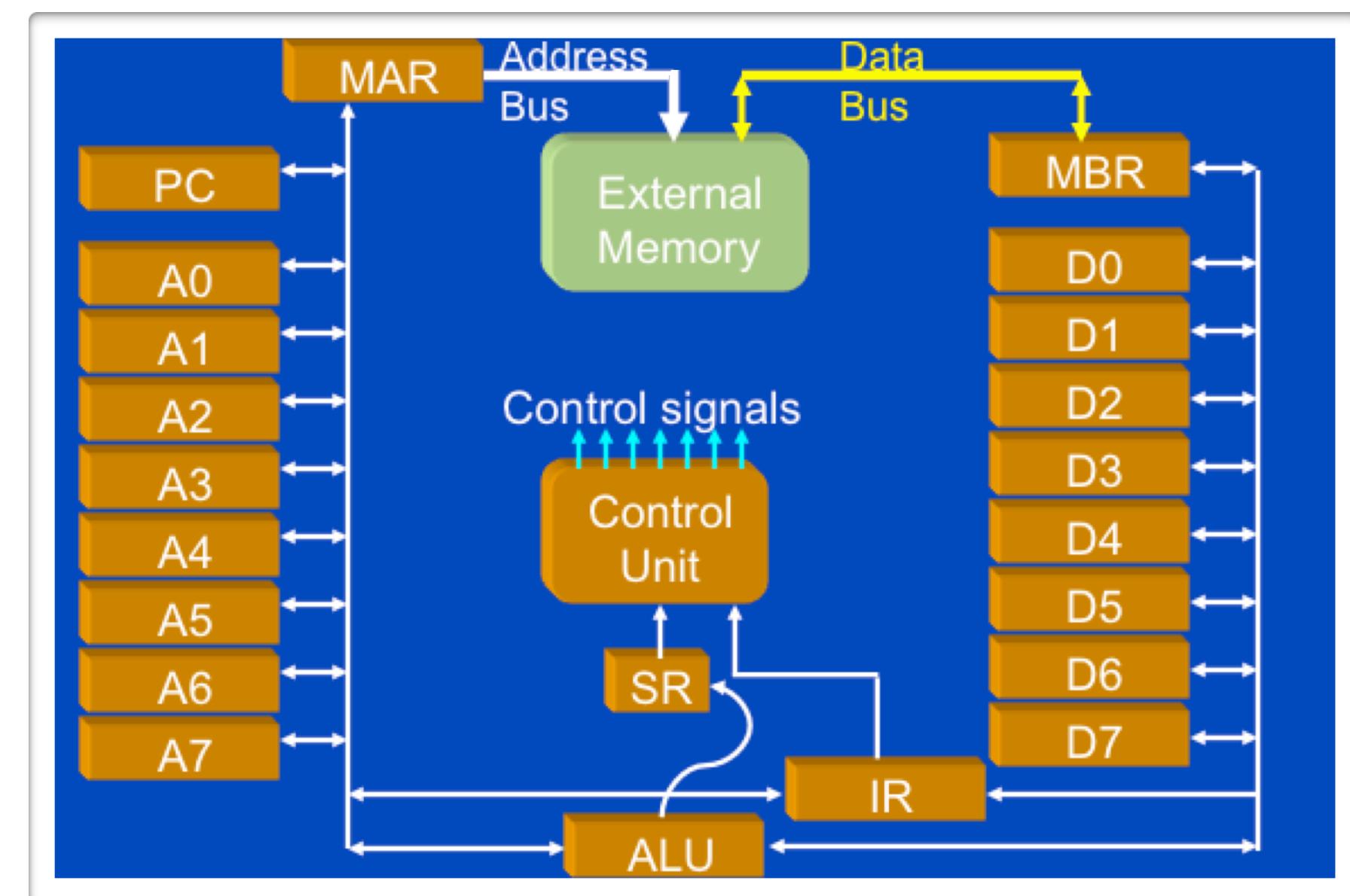
Topic 4 - Machine Code & Assembler

Learn by studying a real computer architecture

Write programs in assembly language

The role of subroutines and stacks

How addressing modes govern the way
in which data is located



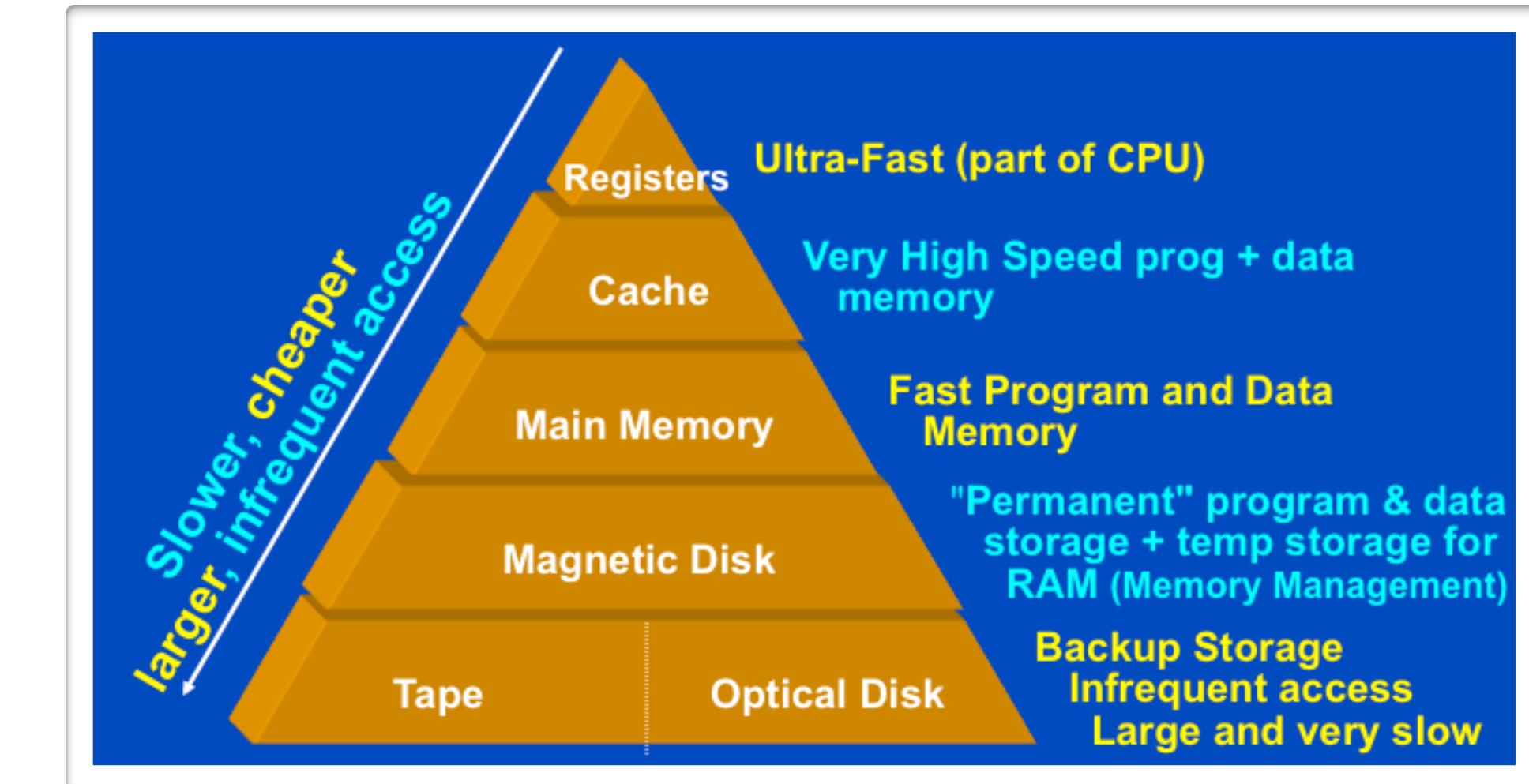
Topic 5 - Memory Systems

Principles and characteristics of storage devices

How the different devices can be organised into a memory hierarchy

Why do we bother with a memory hierarchy?

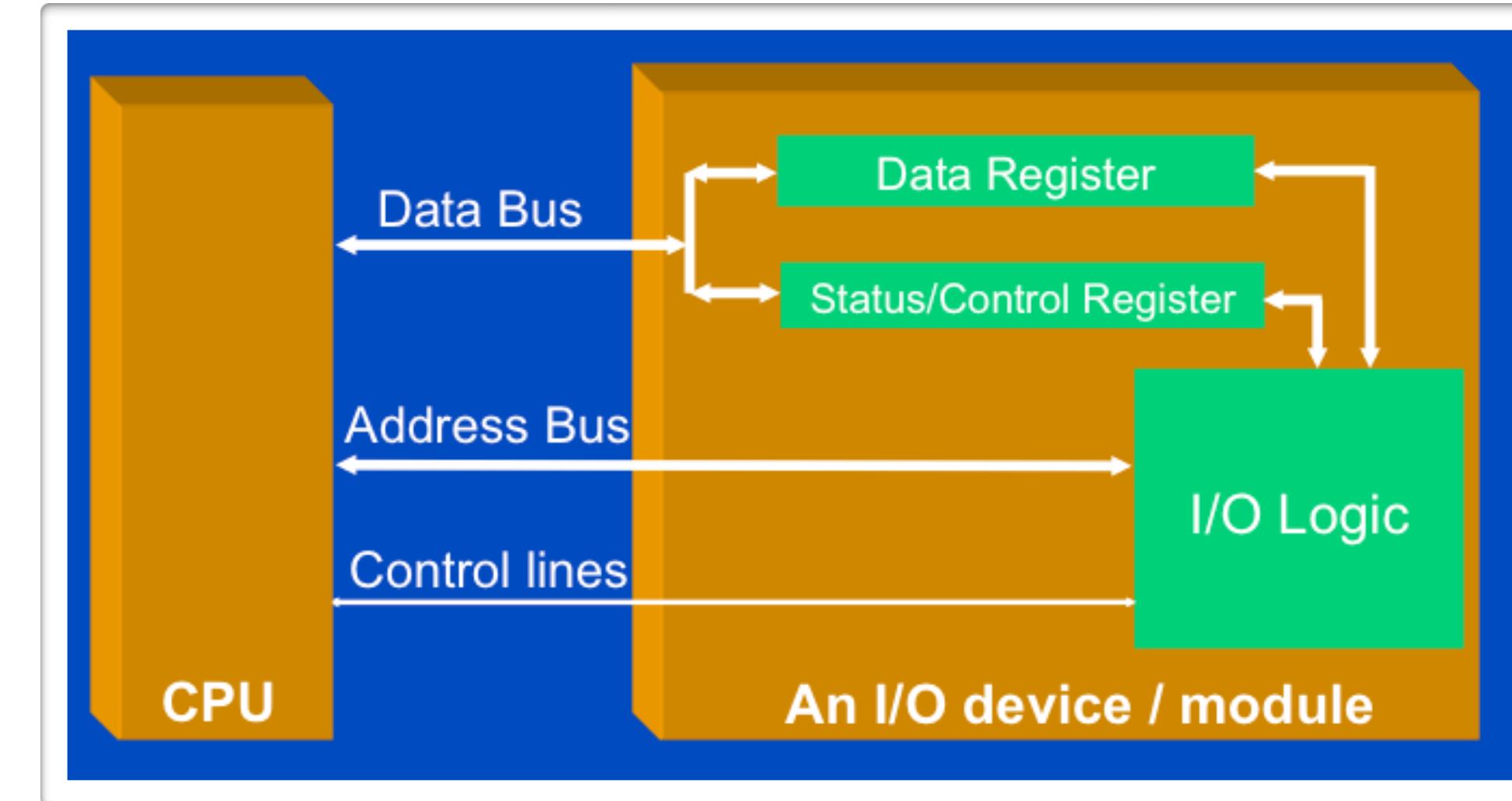
The detection and correction of data errors



Topic 6 - I/O Mechanisms

Input and output techniques that enable a computer system to communicate its environment

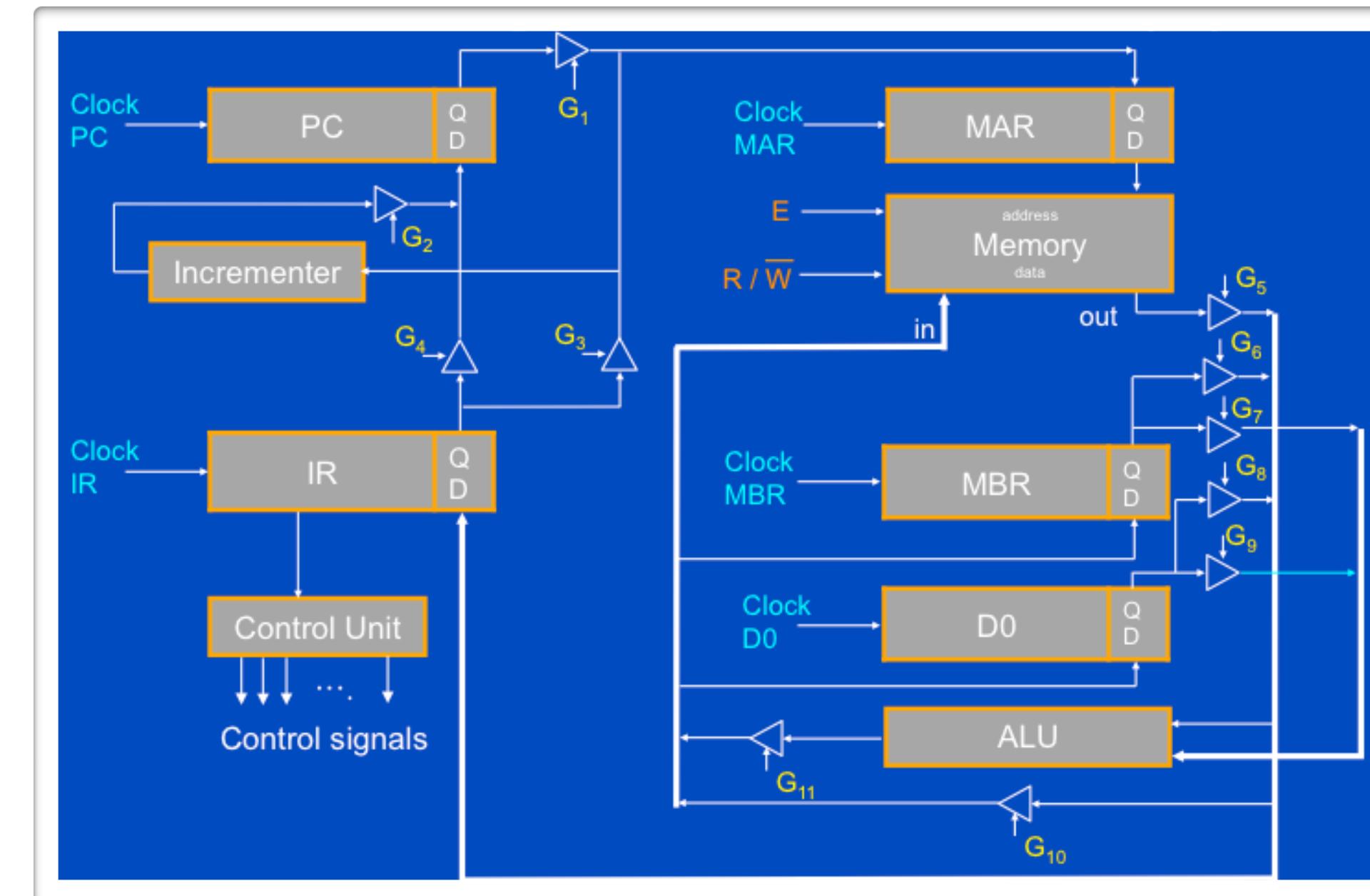
How do devices take input
and provide output?



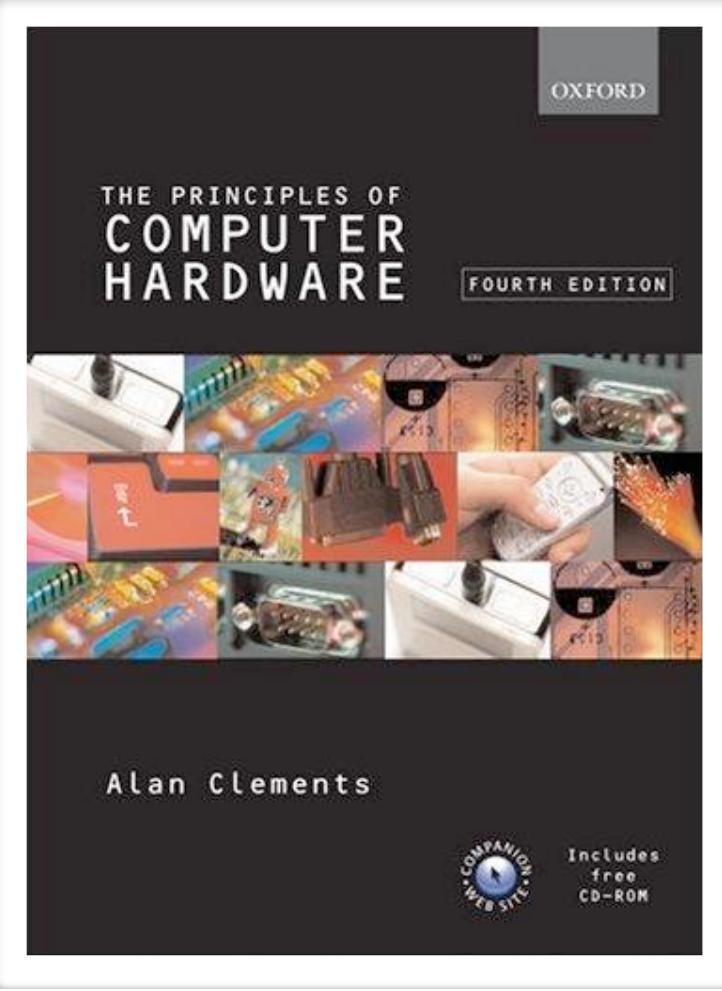
Topic 7 - Processor Architectures

How to combine registers, arithmetic unit, logic unit and control unit to create a processor

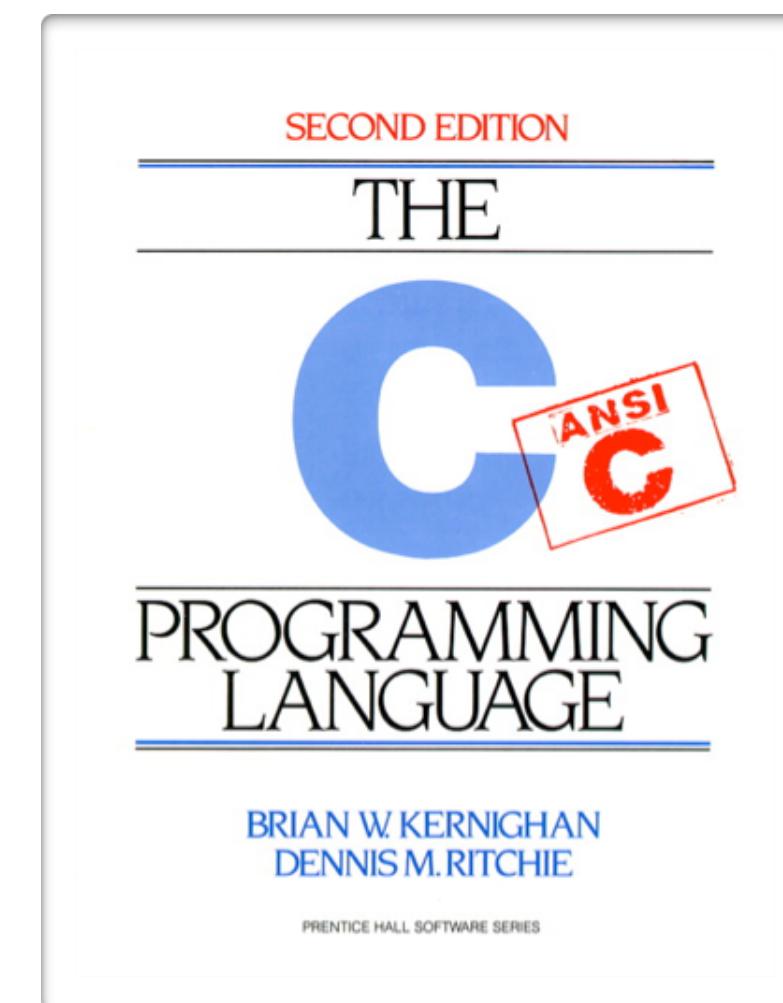
Surely the computer systems we use today are more than this?



Recommended Books

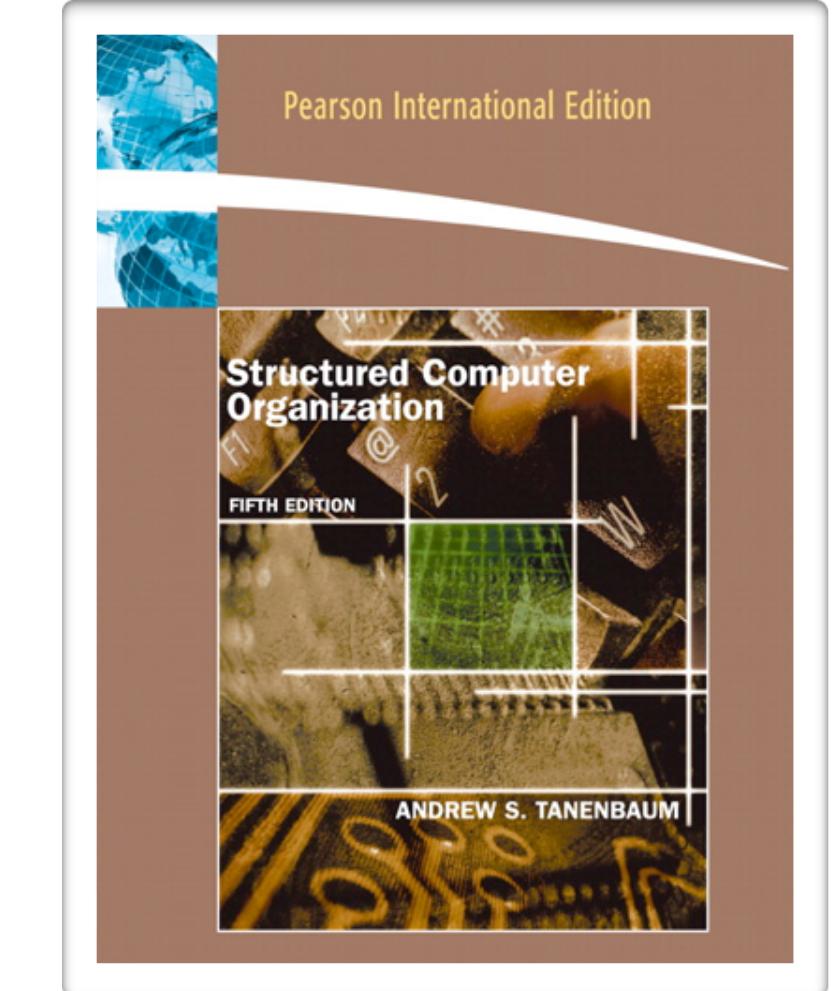


A. Clements. *Principles of Computer Hardware (4th Edition)*, Oxford University Press, February 2006



B. W. Kernighan, D. Ritchie. *The C Programming Language (2nd Edition)*, Prentice Hall, March 1988

T. Muldner. *C for Java Programmers (1st Edition)*, Addison-Wesley, March 2000



Summary

Aim is to provide you with an understanding of how the functional components of a computer system are organised

Emphasis on the hardware aspects of a computer system and how these facilitate the execution of software

Practical skills in the design, construction and use of computer components, as well as their interfacing to microprocessors

