

CSE211

COMPUTER ORGANIZATION AND DESIGN

Lecture #0

Course details

- LTP – 3 1 0 [Three lectures and One Tutorial/week]
- **Text Book**
 - COMPUTER SYSTEM ARCHITECTURE by MORRIS MANO, Prentice Hall of India, 3rd Edition, (2007)

What's CSE 211 All About?!

Introduction to computer architecture

- How is data represented?
- What are the components of a computer?
- How do computers work?

Programming

- How do I "talk" directly to the machine?
- How do I program in C?

Computer Systems and Computation

- How do simple HW/SW elements come together to realize complex computations?

Big Picture

Hardware

- Representing data, transistors, gates, digital logic structures, von Neumann machine model

Assembly language

- Instructions, (structured) programming, input/output,

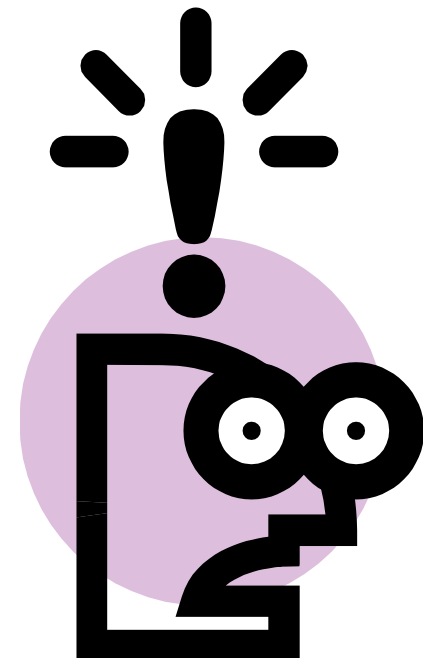
relationship to hardware

C programming

- Syntax, operators, control structures, functions, *pointers*, recursion, data structures, *relationship to assembly language*

The course contents

- Basics Of Digital Electronics
- Register Transfer and Micro Operations
- Basic Computer Organization
- Control Unit
- Central Processing Unit
- Computer Arithmetic
- Input-Output Organization
- Memory Unit
- Introduction to Parallel Processing



- Digital computers store data in the form of binary digits?

a) Yes

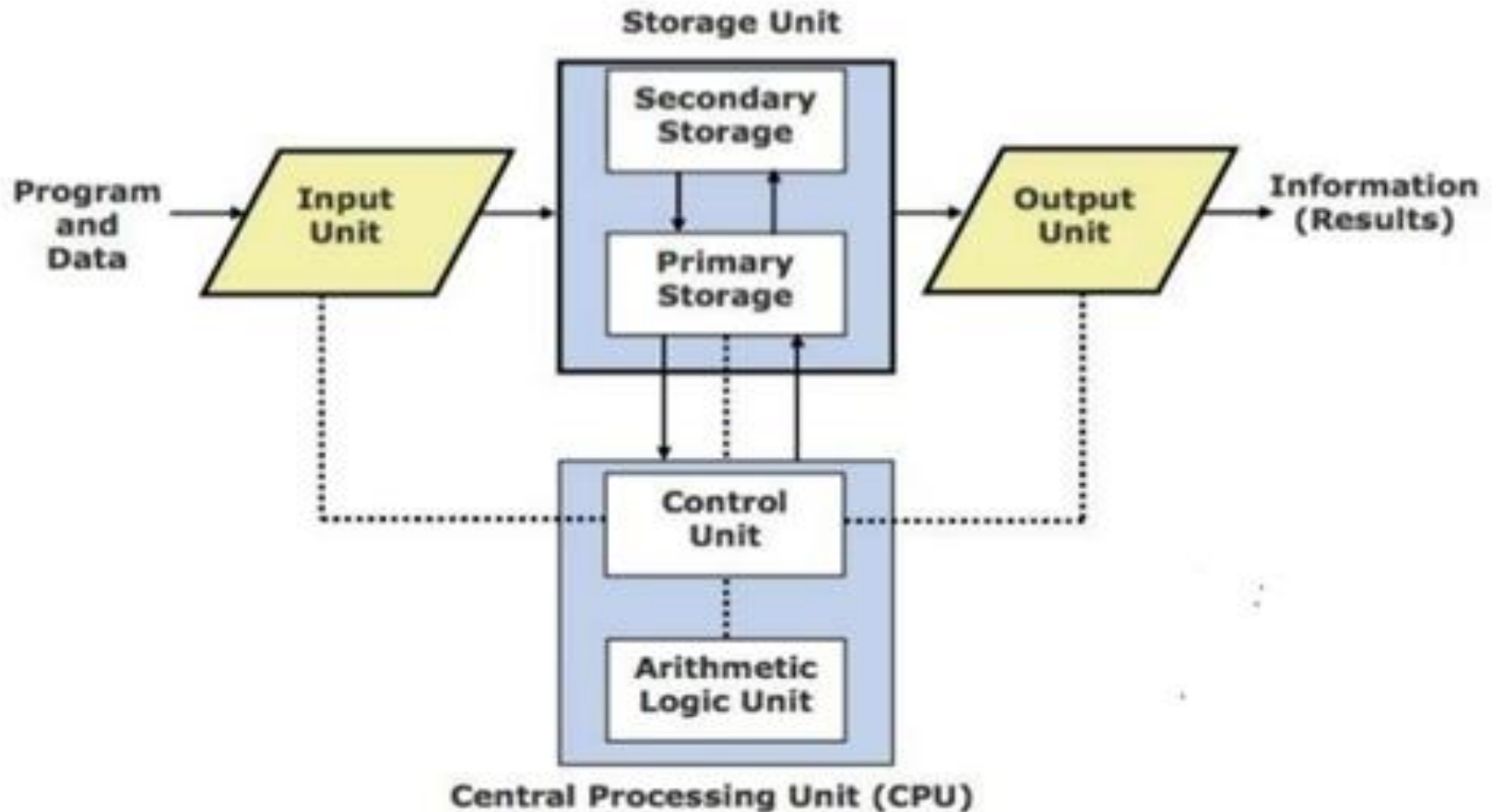
b) No

Computer Organization and Architecture lets you know how exactly each instruction is executed at the micro level. The data flow, timing analysis, memory hierarchy, trade offs between execution cycles, hardware requirements/costs, software-hardware trade-offs can be known.

Computer Organization

- Arrangement of various functional components.

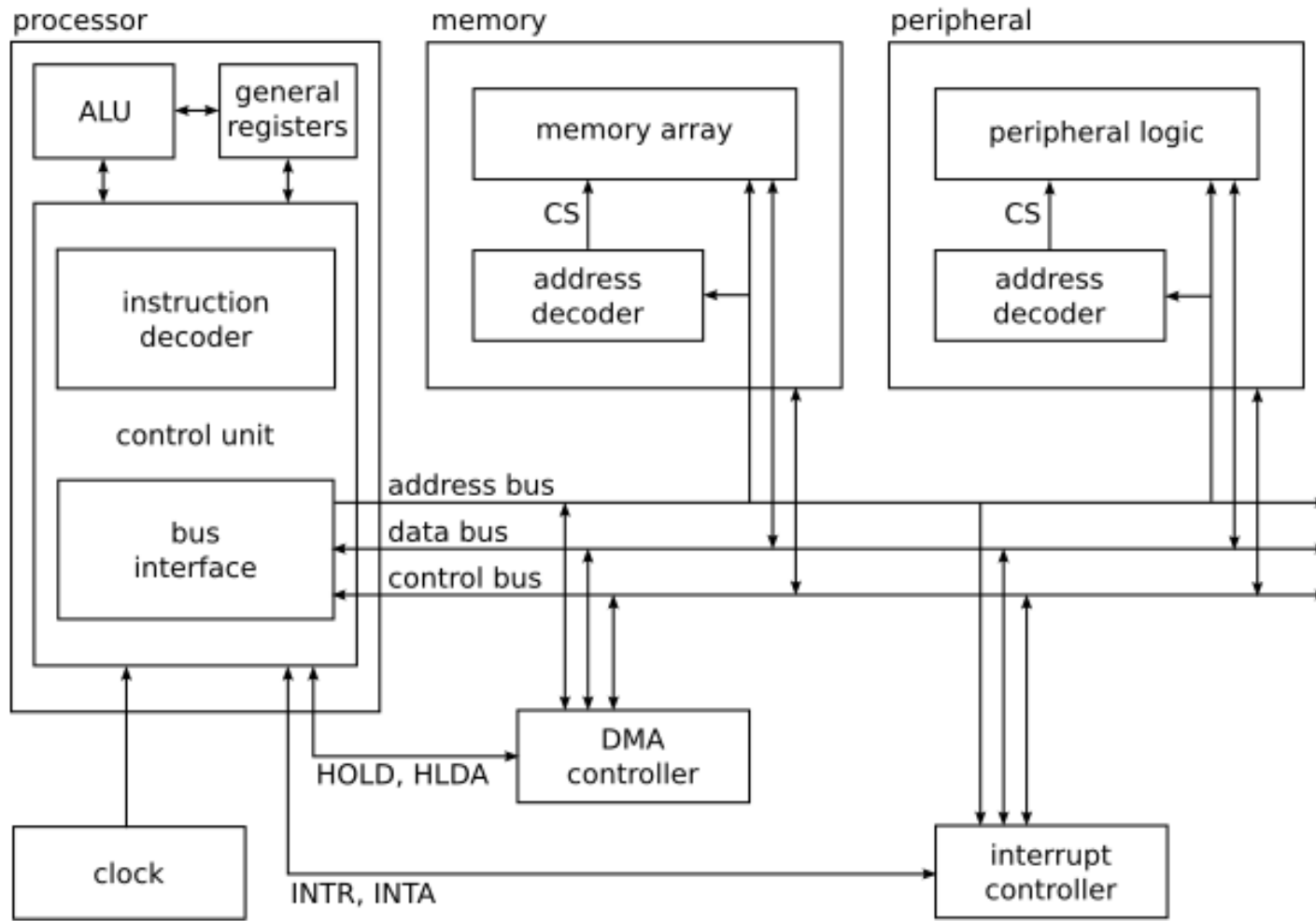
Computer Organization



Computer Architecture

- Study of how various functional components are interacting with one another.
- Knowledge of addressing modes and ISA.

Computer Architecture



Instruction set architecture

- the **instruction set architecture** refers to what the **programmer** sees as the machine's instruction set. The instruction set is the boundary between the hardware and the software, and most of the decisions concerning the instruction set affect the hardware, and the converse is also true, many hardware decisions may beneficially/adversely affect the instruction set.

Structure & Function

- Structure is the way in which components **relate to each other**
- Function is the operation of individual components as **part of the structure**

Types of computer

- **Mainframes:** large computers that can support many users while delivering great computing power. It is mainly in mainframes where most of the innovations (both in architecture and in organization) have been made.
- **Minicomputers:** have adopted many of the mainframe techniques, yet being designed to sell for less, satisfying the computing needs for smaller groups of users. It is the minicomputer group that improved at the fastest pace.

- **Supercomputers:** designed for scientific applications, they are the most expensive computers (over one million dollars), processing is usually done in batch mode, for reasons of performance.
- **Microcomputers:** have appeared in the microprocessor era (the first microprocessor, Intel 4004, was introduced in 1971). The term *micro* refers only to physical dimensions, not to computing performance. A typical microcomputer (either a PC or a workstation) nicely fits on a desk. Microcomputers are a direct product of technological advances: faster CPUs, semiconductor memories, etc. Over the time many of the concepts previously used in mainframes and minicomputers have become common place in microcomputers.

Microprocessors

The microprocessor is an essential component of the computer. It is a silicon chip that comprises millions of transistors and other electronic components that process millions of instructions per second. A Microprocessor is a versatile chip, that is combined with memory and special-purpose chips and pre-programmed by a software. It accepts digital data as I/P and processes it according to the instructions stored in the memory. The microprocessor has many functions like functions of data storage, interact with various other devices and other time-related functions. But, the main function is to send and receive the data to make the function of the computer well.

1950s

Silicon
Transistor



1
Transistor

1960s

TTL
Quad Gate



16
Transistors

1970s

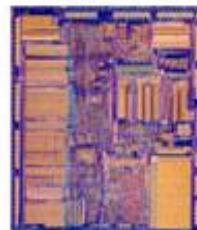
8-bit
Microprocessor



4500
Transistors

1980s

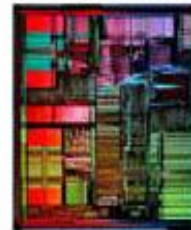
32-bit
Microprocessor



275,000
Transistors

1990s

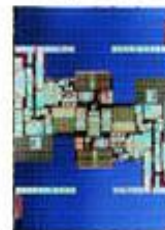
32-bit
Microprocessor



3,100,000
Transistors

2000s

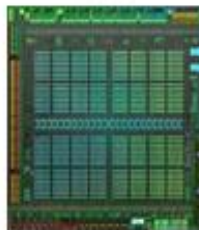
64-bit
Microprocessor



592,000,000
Transistors

2010s

3072-Core
GPU



8,000,000,000
Transistors