

# CSE 3103: Microprocessor and Microcontroller

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**Lecture 2**

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- About Microprocessor
- History of CISC Processor
- History of RISC Processor
- CISC vs RISC

# About Microprocessor

- A single IC package with numerous pins
- Consists of millions of transistors and other electronic components
- A single chip CPU
- Controls and performs all the computations and operations of a microcomputer
- Communicate with internal and external devices through port
- Two types of port:
  - 1 serial port
  - 2 parallel port

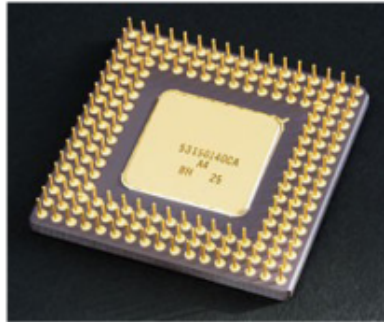


Figure 1

# Organization of a Microprocessor

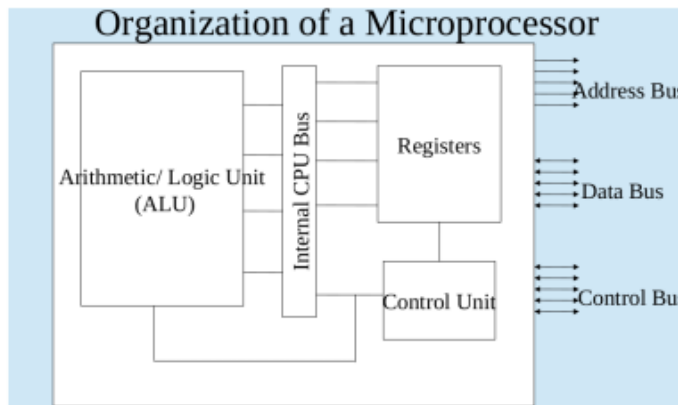


Figure 2

- A typical microprocessor consists of ALU in association with CU to process the instruction execution
- All the microprocessor are based on store-program concept: instructions are stored in the memory locations that are to be executed

The data processing unit of the microprocessor. It performs:

- ① Arithmetic Operation (addition, subtraction, multiplication and division).
- ② Logical Operation (OR, AND, NOT etc)
- ③ Decision Making.

- Minimal Internal memory.
- A set of registers used as storage space.
- ALU accesses this memory during it's operation.
- Operates at a very high speed and a temporary memory.
- Purpose:
  - 1 Minimizes the main memory access.
  - 2 Used to control the operation of CPU and to control the execution of programs.

It coordinates and controls the operations of the central processing unit.

- ① Determines the instruction to be executed.
- ② Determines the operations to be performed.
- ③ Determines what data are needed and where they are stored.
- ④ Determines where the result to be stored.
- ⑤ Determines where the next instruction is located.
- ⑥ Causes the next instruction to be executed.
- ⑦ Transfer control to the next instruction.
- ⑧ It communicates with input devices to begin the transfer of data and instructions into memory and with output devices to begin the transfer of results from memory.

# Execution Steps of a Microprocessor

- Basic steps performed by a microprocessor to perform an operation
  - fetch: reads each instruction from memory
  - decode: interprets the instruction
  - execute: performs the operation according to the instruction



Figure 3: Steps to execute an instruction



- MidTerm Exam : 15 [Month of March]
- Quizz 1: 5 [12.02.2024]
- Quizz 2: 5 [29.03.2024]
- Quizz (Sudden): 5

**Attendance in class is expected. Attendance will be collected during the class time for further usage. If you are unable to attend class, it is your responsibility to obtain class notes or other information. Make-up quizzes will not be allowed !!!**

# What is an Architecture of a Computer

- Defined by the instructions a processor can execute
- Programs written for one processor can run on other processors of the same architecture
- Most commonly used architecture
  - IA32 (x86)
  - IA64
  - ARM
  - PowerPC
  - SPARC

# What is Instruction

- Basic actions a processor can take
- opcode operand1,operand2,....;Comments
  - ADD AX,BX : Add value AX to BX and store in AX
  - CMP BX,10: Compare value in BX to 10
  - LDR R4,=HELLO`WORLD : Get the memory address value of
  - HELLO`WORLD
  - LDR R3, [R4]: Get the value code 0x12345678 in R4
- Every program must be converted to the processor instructions of the computer it will be run on

# Microprocessor Specification

- Word: Basic data size, processed by ALU. A 16 bit binary number is called the word in a 16-bit processor
- Memory word: Number of bits, stored in a register/memory element
- Word length: Number of bits processed at a time
- Bus: A x-bit processor has x-bit data bus. A x-bit processor can address  $2^x$  different memory locations
- Clock: The oscillator generates a number of electronic pulses, used by the computer to synchronize operations. Transition from +ve to -ve or vice-verse is a cycle and the total amount of cycle/sec is hertz.
- MIPS: Microprocessor generally requires 10 clock cycles to complete a single instruction. Speed of a processor is measured with MIPS (million of instructions/sec)

# Classification of Microprocessor

- Based on size of data bus:
  - 4-bit microprocessor
  - 8-bit microprocessor
  - 16-bit microprocessor
  - 32-bit microprocessor
  - 64-bit microprocessor
- Based on application:
  - General purpose microprocessor
  - Special purpose microprocessor
- Based on architecture:
  - Complex Instruction Set Computer (CISC) microprocessor
  - Reduced Instruction Set Computer (RISC) microprocessor