Introduction to Microprocessor Based Systems Design

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Microprocessor

 Microprocessor is a **hardware component of computer**, and it works as brain of the computer system as well as **use in computer** because without using microprocessor, Computer like as plastic box. Microprocessor shape as a small chip that is made by silicon and it has to responsible to all functions of central processing unit.

 Microprocessor meaning is a control unit of **computer** because it is able to manage all various Arithmetic Logical Unit (ALU) operations. Microprocessor can capable to execute other operations such as computational activities like as addition/subtraction, internal processing, device terminals communication, and I/O management.

Block Diagram of Digital Computer

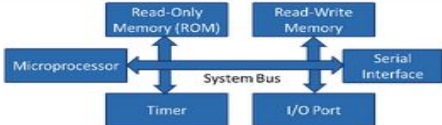UCS617: Microprocessor Based Systems Design

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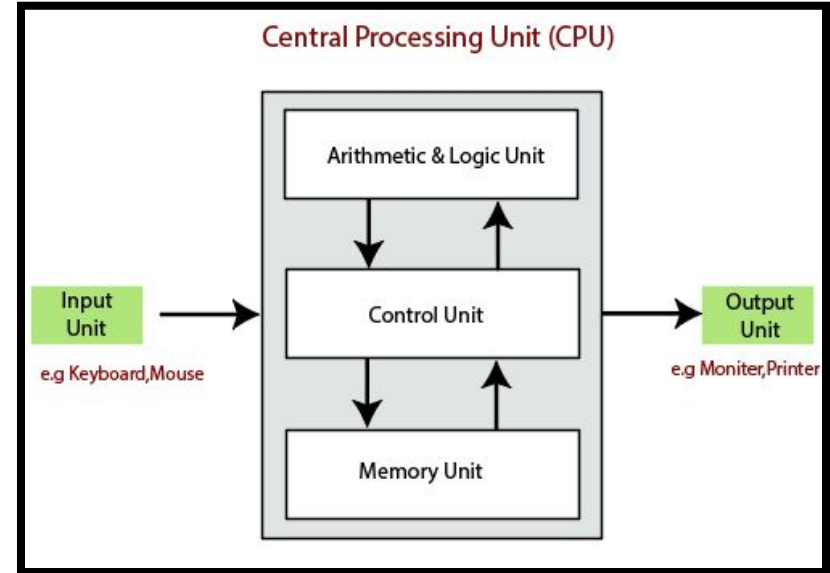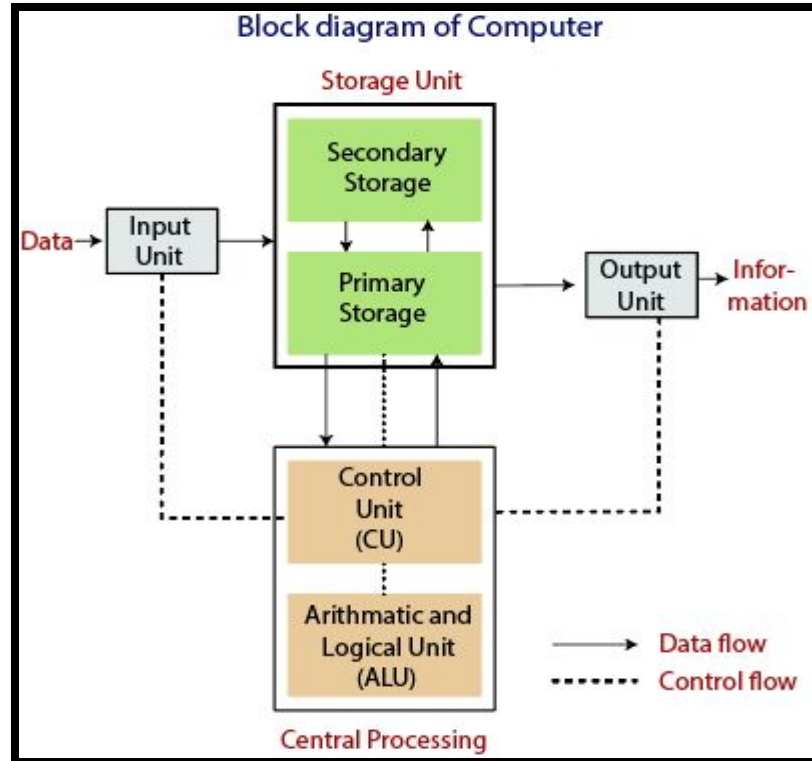
Block Diagram of Digital Computer

- The data is entered through input devices such as the keyboard, mouse, etc. This set of instruction is processed by the CPU after getting the input by the user, and then the computer system produces the output. The computer can show the output with the help of output devices to the user, such as monitor, printer, etc.
  - CPU (Central Processing Unit)
  - Storage Unit
  - ALU (Arithmetic Logic Unit)
  - Control Unit
- The computer system is nothing without the **Central processing Unit** so, it is also known as the brain or heat of computer. The CPU is an electronic hardware device which can perform different types of operations such as arithmetic and logical operation.

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Evolution of Microprocessors

Processor	Year	Feature Size (μm)	Transistors	Frequency (MHz)	Word Size	Power (W)	Cache (L1 / L2 / L3)	Package
4004	1971	10	2.3k	0.75	4	0.5	none	16-pin DIP
8008	1972	10	3.5k	0.5–0.8	8	0.5	none	18-pin DIP
8080	1974	6	6k	2	8	0.5	none	40-pin DIP
8086	1978	3	29k	5–10	16	2	none	40-pin DIP
80286	1982	1.5	134k	6–12	16	3	none	68-pin PGA
Intel386	1985	1.5–1.0	275k	16–25	32	1–1.5	none	100-pin PGA
Intel486	1989	1–0.6	1.2M	25–100	32	0.3–2.5	8K	168-pin PGA
Pentium	1993	0.8–0.35	3.2–4.5M	60–300	32	8–17	16K	296-pin PGA
Pentium Pro	1995	0.6–0.35	5.5M	166–200	32	29–47	16K / 256K+	387-pin MCM PGA
Pentium II	1997	0.35–0.25	7.5M	233–450	32	17–43	32K / 256K+	242-pin SECC
Pentium III	1999	0.25–0.18	9.5–28M	450–1000	32	14–44	32K / 512K	330-pin SECC2
Pentium 4	2000	180–65 nm	42–178M	1400–3800	32/64	21–115	20K+ / 256K+	478-pin PGA
Pentium M	2003	130–90 nm	77–140M	1300–2130	32	5–27	64K / 1M	479-pin FCBGA
Core	2006	65 nm	152M	1000–1860	32	6–31	64K / 2M	479-pin FCBGA
Core 2 Duo	2006	65–45 nm	167–410M	1060–3160	32/64	10–65	64K / 4M+	775-pin LGA
Core i7	2008	45 nm	731M	2660–3330	32/64	45–130	64K / 256K / 8M	1366-pin LGA
Atom	2008	45 nm	47M	800–1860	32/64	1.4–13	56K / 512K+	441-pin FCBGA

Microprocessor	Micro Controller
Microprocessor is heart of Computer system.	Micro Controller is a heart of embedded system.
It is just a processor. Memory and I/O components have to be connected externally	Micro controller has external processor along with internal memory and i/O components
Since memory and I/O has to be connected externally, the circuit becomes large.	Since memory and I/O are present internally, the circuit is small.
Cannot be used in compact systems and hence inefficient	Can be used in compact systems and hence it is an efficient technique
Cost of the entire system increases	Cost of the entire system is low
Due to external components, the entire power consumption is high. Hence it is not suitable to used with devices running on stored power like batteries.	Since external components are low, total power consumption is less and can be used with devices running on stored power like batteries.
Most of the microprocessors do not have power saving features.	Most of the micro controllers have power saving modes like idle mode and power saving mode. This helps to reduce power consumption even further.
Since memory and I/O components are all external, each instruction will need external operation, hence it is relatively slower.	Since components are internal, most of the operations are internal instruction, hence speed is fast.
Microprocessor have less number of registers, hence more operations are memory based.	Micro controller have more number of registers, hence the programs are easier to write.
Microprocessors are based on von Neumann model/architecture where program and data are stored in same memory module	Micro controllers are based on Harvard architecture where program memory and Data memory are separate
Mainly used in personal computers	Used mainly in washing machine, MP3 players

Syllabus

1. 8085 Microprocessor
2. 8086 Microprocessor
3. Interfacing
4. ARM

Books

- *Gaonkar R., Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing India Pvt. Ltd. (2013) 6th ed.*

- *Hall V. D. and Rao S., Microprocessor and Its Interfacing, Tata McGraw Hill Publishing Company (2012) 3rd ed.*

- *Furber S., ARM System on Chip Architecture, Pearson Education (2000) 2nd Edition.*

- *Liu Y. and Gibson A. G., Microcomputer Systems: The 8086/8088 Family Architecture Programming and Design, Pearson (2006) 2nd ed.*

- *Sloss N. A., Symes D. and Wright C., ARM System Developer's Guide, Morgan Kaufmann publications (2004).*

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