Faculty of engineering - Shoubra
Benha University

Research Project

in fulfillment of the requirements of

Department	**Engineering Mathematics and Physics**
Division	**----------**
Academic Year	**2019-2020 Preparatory**
Course name	**Computer**
Course code	**ECE001**

Topic:-

Computer Architecture

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Approved by:

Examiners committee	Signature
Dr.Ahmed Bayoumi	
Dr.Shady Elmashad	
Dr. Abdelhamid Attaby	

Computer Architecture

❖ Application brief:

- In computer engineering, computer architecture is a set of rules and methods that define the design, structure, and implementation of computer systems. Some architecture concepts describe it as defining a computer's capabilities and programming model but not a concrete implementation. In other concepts computer architecture requires software creation of instructions set, microarchitecture design, logic design, and implementation.

- I chose this topic to show, in first website page, that A computer's architecture is chosen for the types of programs to be run on it (business, science, general-purpose, etc.). Its principal components or subsystems, each of which has its own architecture, are input / output, storage, communication, transmission, and power.

- Second website page shown definition of the computer, Data Vs. Information, Hardware vs. software and Types of Computers which divided into two basic types:

  1. Stationary: like Desktop computers and Supercomputer.
  2. Portable: such as Laptop computers and Tablet computers.

- Third website page shown What Is Memory, What Is storage, some information about them and Comparison between them.

- In 4th website page, I explain some of in/out put devices.
  - **Input devices:** The main function of input devices is to direct commands and data into computer. Some examples:
    - Mouse
    - keyboard
    - Webcam
    - Microphone
  - **Output Devices:** The main purpose of these devices is converting information into human-readable form. Some examples:
    - Monitor
    - Printers
    - Projector
  - **Both Input / Output Devices:** Devices which may receive data from users or other devices, and send data to other devices or computers as well. Some of its examples:
    - Headsets
    - Touch Screen
    - CD-RW drives and DVD-RW drives

- 5th website page explain Motherboard and CPU
  - **Motherboard:** It maintains and allows communication among many of a system's electronic components.
  - **CPU (Central Processing Unit):** is the brain of the computer that control the function of the components.

Screenshots

- ## Computer Architecture main page

  - ### website:

Computer Architecture mainpage

Links:

- Mainpage
- Computer Architecture
- Computers and their types
- Memory vs.Storage
- Input and Output Devices
- Motherboard and CPU

This is the main page for Computer Architecture which connected to five pages which talk about computer architecture, Computers and their types, Memory vs.Storage, Input and Output Devices in addition to some information about motherboard and CPU.

  - ### source code:

```
<html>
<body>
<center><h1>Computer Architecture mainpage</h1></center>

<h2> Links: </h2>
<ul>
 <li><a href="mainpage.html">Mainpage</a></li>
 <li><a href="Computer Architecture.html">Computer Architecture</a></li>
 <li><a href="Computers and their types.html">Computers and their types</a></li>
 <li><a href="Memoryvs.Storage.html">Memory vs.Storage</a></li>
 <li><a href="InputandOutputDevices.html">Input and Output Devices</a></li>
 <li><a href="MotherboardandCPU.html">Motherboard and CPU</a></li>
</ul>
<p style="font-size:120%">This is the main page for Computer Architecture which connected to five pages
</body>
</html>
```

- ## Computer Architecture

  - ### website:

Computer Architecture

Links:

- Mainpage
- Computers and their types
- Memory vs.Storage
- Input and Output Devices
- Motherboard and CPU

*While the term computer architecture sounds very complex, it is easier to describe than one would expect. Computer architecture is a science or a collection of rules that describe how computer software and hardware are combined and communicate to make a machine work together. It defines not only how the computer functions but also which computer technologies are capable of.Computers continue to be a major part of our lives, and computer architects continue to create new and better technology and programs.Computer architecture, Digital computer's internal structure, encompassing the nature and layout of its instruction set and data registers. A computer's architecture is chosen for the types of programs to be run on it (business , science, general-purpose, etc.). Its principal components or subsystems, each of which has its own architecture,Are input / output, storage , communication, transmission, and power.

*Computer architecture is a specification which describes how hardware and software technologies interact to create a platform or system of computers. If we think of the word architecture, we think about the design of a house or a building. With the same idea in mind, computer architecture requires designing a Computer and everything that goes into a computer system.Computer architecture consists of three main categories.

➢ **source code:**

```
<html>
<body>
<center><h1>Computer Architecture</h1></center>

<h2> Links: </h2>
<ul>
 <li><a href="mainpage.html">Mainpage</a></li>
 <li><a href="Computers and their types.html">Computers and their types</a></li>
 <li><a href="Memoryvs.Storage.html">Memory vs.Storage</a></li>
 <li><a href="InputandOutputDevices.html">Input and Output Devices</a></li>
 <li><a href="MotherboardandCPU.html">Motherboard and CPU</a></li>
</ul>
<p style="font-size:120%">*While the term computer architecture sounds very complex,
<p style="font-size:120%">*Computer architecture is a specification which describes h
<ul>
 <li style="font-size:120%">System design: This involves all aspects of the hardware,
 <li style="font-size:120%">Instruction set architecture: This includes the functions
 <li style="font-size:120%">Microarchitecture: This defines the data processing and s
</ul>
<p style="font-size:120%">All these parts go together in a certain order and must be
</body>
</html>
```

- **Computers and their types**

➢ **website:**

Types of Computers

Computers come in many shapes and sizes and perform a number of different functions in our daily life. You are using a form of machine when you withdraw cash from an ATM, check grocery stores at the supermarket or use a calculator. Most people think of a personal computer like a desktop or a laptop when they hear the word computer. let us show different types of computers and some information about each of them.

A.Stationary

1. **Desktop computers:** can be used at work, home, and school. Desktop computers are designed to be placed on a desk, and they're typically made up of a few different parts, including the computer case, monitor, keyboard, and mouse- Used in businesses that manage large amounts of data- A large, expensive computer that Separate case plus peripheral devices.

➢ **source code:**

```
<html>
<body>
<center><h1>Computers and their types</h1></center>
<h2> Links: </h2>
<ul>
  <li><a href="mainpage.html">Mainpage</a></li>
  <li><a href="Computer Architecture.html">Computer Architecture</a></li>
  <li><a href="Memoryvs.Storage.html">Memory vs.Storage</a></li>
  <li><a href="InputandOutputDevices.html">Input and Output Devices</a></li>
  <li><a href="MotherboardandCPU.html">Motherboard and CPU</a></li>
</ul>

<p style="font-size:160%"><b>what is a computer?</b></p>
<p>A computer is an electronic device manipulating data, or information. It has the ability to store, retrieve, and process data.This can be used t
<center><img src="https://5.imimg.com/data5/EF/RQ/MY-3030942/lenovo-desktop-computer-500x500.jpg" alt="computer" /></center>
<p style="font-size:140%"><b>Data Vs Information</b></p>
<ul>
   <li><b><big>Data:</big></b>is a representation of a fact, figure, or idea. Data can be a number, a word, a picture, or even a recording of sounc
   <li><b><big>Information:</big></b>is data that has been organized or presented in a meaningful fashion.</li>
</ul>

<p style="font-size:140%"><b>Hardware vs. software</b></p>
<ul>
<p>Before talking about different types of computers, let 's talk about two aspects that are common to all computers: hardware and software.</p>
   <li><b><big>Hardware:</big></b>is any part of your computer that has a physical structure, such as the keyboard or mouse. It also includes all t
   <center><img src="https://media.gcflearnfree.org/content/55e0730c7dd48174331f5164_01_17_2014/interior_motherboard.jpg" alt="the internal parts c
   <li><b><big>Software:</big></b>is any set of instructions or data telling the hardware what to do and how to do it. This contrasts with the phys
   <center><img src="https://media.gcflearnfree.org/assets/content/computerbasics/1/know_open_blank.png" alt="Microsoft PowerPoint image which is t
</ul>

<p>Everything you do on your computer depends on both software and hardware. For example, if you see a lesson in a Web browser (software) and click
<p style="font-size:140%"><b>Types of Computers</b></p>
<p>Computers come in many shapes and sizes and perform a number of different functions in our daily life. You are using a form of machine when you
```

- # Memory vs. Storage

➢ **website:**

Why is storage necessary?

Storage:

- Is cheaper than memory.
- Plays an input role when starting applications.
- Is needed for output.
- Plays an important role during startup.
- Devices can hold a large amount of data.
- Retains data when the computer is turned off.

Capacity and Speed of Storage Devices

A storage device's performance is measured by:

- **Capacity:**The number of bytes of data that a device can hold.
- **Access Time:**The amount of time, in milliseconds (ms), it takes for the device to begin reading data.

	Floppy Disk	Hard Drive	CD ROM / DVD
shape			
Capacity	720 KB to 1.44 MB	Up to 1 TB	CD-ROM 650 MB; DVD 17 GB
Access Time	100ms	6 to 12ms	80 to 800ms

	memory	storage
Data retention	Data stored in memory (here refers to RAM) is temporary, and you will lose the data when you shut down your computer.	storage devices can keep data for a long-term, even without power.
Capacity	Capacity of memory is much smaller than storage. Nowadays,it is common to see memory of 4 GB and there are 2GB, 6GB and 8 GB in a computer. Theoretically, the current maximum operating memory supported by computers is 512 GB.	While there are hard drives largerthan2 TB.
The cost	Memory is much more expensive than storage. One GB of RAM costs about $8.	1 GB of hard drive storge space costs about 10 cents.
Speed	RAM runs much faster than storage devices.	storage devices runs slower than RAM.
Purpose	the memory (RAM) is used to temporarily store the operational data ofthe CPU and the data exchanged with the hard drive, which means that all programs will be loaded from the storage device and run in the memory.	A storage device is used to store data (including programs).

➢ **source code:**

```
<p style="font-size:140%"><b>Why is storage necessary?</b></p>
<p style="font-size:125%"><b>Storage:</b></p>
<ul>
  <li style="font-size:120%">Is cheaper than memory.</li>
  <li style="font-size:120%">Plays an input role when starting applications.</li>
  <li style="font-size:120%">Is needed for output.</li>
  <li style="font-size:120%">Plays an important role during startup.</li>
  <li style="font-size:120%">Devices can hold a large amount of data.</li>
  <li style="font-size:120%">Retains data when the computer is turned off.</li>
</ul>
<center><p style="font-size:160%"><b>Capacity and Speed of Storage Devices</b></p></center>
  <p style="font-size:140%"><b>A storage device's performance is measured by:</b></p>
<ul>
  <li style="font-size:120%"><b>Capacity:</b>The number of bytes of data that a device can hold.</li>
  <li style="font-size:120%"><b>Access Time:</b>The amount of time, in milliseconds (ms), it takes for the device to begin reading data.</li>
</ul>

<table border="1" align="center" width="80%">
  <tr>
    <th style="font-size:120%"></th>
    <th style="font-size:120%">Floppy Disk</th>
    <th style="font-size:120%">Hard Drive</th>
    <th style="font-size:120%">CD ROM / DVD</th>
  </tr>
  <tr>
    <th style="font-size:120%">shape</th>
    <td><center><img src="https://digitizemytapes.com/wp-content/uploads/2018/10/DMT-CM001-FloppyDisc-3.5.png" alt="Floppy Disk" width="150" height="100"/></center></td>
    <td><center><img src="https://images-na.ssl-images-amazon.com/images/I/41OHTB46hoL._SX466_.jpg" alt="Hard Drive" width="150" height="100"/></center></td>
    <td><center><img src="http://1.bp.blogspot.com/-IS6pav2t3Rg/TafeMIJv6mI/AAAAAAAAAEQ/_-QfeZqj7sY/s1600/cdrom%252BDisk.jpg" alt="CD ROM / DVD" width="150" height="100"/></center><
  </tr>
  <tr>
    <th style="font-size:120%">Capacity</th>
    <td style="font-size:110%"><center>720 KB to 1.44 MB</center></td>
    <td style="font-size:110%"><center>Up to 1 TB</center></td>
    <td style="font-size:110%"><center>CD-ROM 650 MB; DVD 17 GB</center></td>
  </tr>
```

- # Input and Output Devices

➢ **website:**

Output Devices

A device capable of receiving data from a computer or other system and generating output with that data is called the output unit. Examples of various output devices are as follows:

1. **Monitor:**A monitor is an output device that is responsible for receiving data from a computer and displaying that information as text or images for users to see on a screen.

Types of Monitors

- **Cathode-ray tube (CRT):**use picture tube technology; inexpensive, but they take up desk space and use a lot of energy.
- **Liquid Crystal Display (LCD or flat-panel):**Cells sandwiched between two transparent layers form images; expensive, and they take up less desk space and use less energy than CRT monitors.
- **Light-emitting diode (LED):**is more energy-efficient and has better color accuracy and thinner panels than LCD monitors.

➢ **source code:**

```
<p style="font-size:160%"><b>Output Devices</b></p>
<p style="font-size:120%">A device capable of receiving data from a computer or other system and generating output with that data is called the output uni
<center><img src="https://advisers4u.com/wp-content/uploads/2020/03/output-devices-1250x703.png" alt="Output Devices" width="600" height="300"/></center>
<ol>
  <li style="font-size:120%"><b>Monitor:</b>A monitor is an output device that is responsible for receiving data from a computer and displaying that infor
  <p style="font-size:140%"><b>Types of Monitors</b></p>
    <ul>
     <center><img src="https://www.ipsmonitor.co.uk/blog/wp-content/uploads/2012/03/crt-vs-lcd-vs-ips-monitors.png" alt="Types of Monitors" width="600" he
     <li style="font-size:120%"><b>Cathode-ray tube (CRT):</b>use picture tube technology; inexpensive, but they take up desk space and use a lot of energ
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     <li style="font-size:120%"><b>Light-emitting diode (LED):</b>is more energy-efficient and has better color accuracy and thinner panels than LCD monit
    </ul>
  <li style="font-size:120%"><b>Speakers:</b>Receives sound signal from a computer and then plays that sound signal and thus we hear songs or music or any
  <li style="font-size:120%"><b>Projector:</b>Gets data from a computer and displays or projects the same information onto a screen or a wall. Projector c
  <li style="font-size:120%"><b>Plotter:</b>is a printer that uses a pen that moves over a large revolving sheet of paper,It is used in engineering and ma
  <li style="font-size:120%"><b>Printers:</b>is a peripheral device that produces a physical copy or hard copy of the computer's output.</li>
  <p style="font-size:140%"><b>Two basic types:</b></p>
    <center><img src="https://www.chtips.com/images/Printer-Types-of-Printer.jpg" alt="Types of Printer" width="400" height="300"/></center>
    <ul>
     <li style="font-size:120%"><b>Impact printer:</b>is a printer that has a print head that contacts the paper to produce a character,It uses ink ribbon
     <li style="font-size:120%"><b>Nonimpact printer:</b></li>
     <p style="font-size:140%"><b>Two types of nonimpact printers:</b></p>
     <ul>
      <li style="font-size:120%"><b>Laser printer:</b>use laser beams and static electricity to deliver toner onto the correct areas of the page. Heat fus
      <li style="font-size:120%"><b>Inkjet printer:</b>are affordable and produce high-quality color printouts quickly and quietly. They spray tiny drops
     </ul>
    </ul>
</ol>
<p style="font-size:160%"><b>Both Input / Output Devices</b></p>
<p style="font-size:120%">An input/output device may receive data from users or other devices, and send data to other devices or computers as well. That m
```

- **Motherboard and CPU**

➢ **website:**

Central Processing Unit

- CPU or processor
- Processes all commands and instructions
- "Brains" of the computer
- Billions of tasks per second
- Controls all functions of the computerâ€™s components

CPU Performance Measures

- Processor speed measured in hertz(Hz),Megahertz(MHz)or gigahertz(GHz)
- Number of cores:
  - Single
  - Dual
  - Quad
  - Ten

CPU Basics

The CPU is your Computer's "brain." The Intel and AMD (Advanced Micro Devices) are Popular manufacturers. The CPU usually has a large heatsink and fan on it, in the case it is distinguishing from other components.

CPU Architecture

In the meantime a CPU is built on wafers at a manufacturing plant (a "fab"). Some wafers are CPU sheets . A CPU also includes millions, often billions, of transistors used to execute millions of instructions per second that are placed on the motherboard through the copper traces.

➢ **source code:**

```
<p style="font-size:160%"><b>Central Processing Unit</b></p>
  <center><img src="https://cdn.sotor.com/thumbs/fit630x300/43134/1565120328/%D8%A8%D8%AD%D8%AB_%D8%B9%D9%86_%D8%A7%D9%84%D9%85%D8%B9%D8%A7%D9%84%D8%AC.jpg" a
 <ul>
  <li style="font-size:120%">CPU or processor</li>
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  <li style="font-size:120%">"Brains" of the computer</li>
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  <li style="font-size:120%">Controls all functions of the computer's components</li>
 </ul>
 <p style="font-size:140%"><b>CPU Performance Measures</b></p>
  <ul>
   <li style="font-size:120%">Processor speed measured in hertz(Hz),Megahertz(MHz)or gigahertz(GHz)</li>
   <li style="font-size:120%">Number of cores:</li>
    <ul>
     <li style="font-size:120%">Single</li>
     <li style="font-size:120%">Dual</li>
     <li style="font-size:120%">Quad</li>
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 <p style="font-size:120%">In the meantime a CPU is built on wafers at a manufacturing plant (a "fab"). Some wafers are CPU sheets . A CPU also includes milli
</body>
</html>
```

***Some of the codes which are used in the websites**

1.
```
<ul>
  <li>text</li>
  <li>text</li>
  <li>text</li>
</ul>
```

This code is used to add an Unordered HTML List.

2.
```
<ol>
  <li>text </li>
  <li>text</li>
  <li>text</li>
</ol>
```

This code is used to add an ordered HTML List.

3. `<a href="url">Link text</a>` This code is used to add an image in html.

4. `<img src="image address" alt="image name">`

This code is used to add an image in html.

5. <h1>the text</h1>

This code is used to produce a large and bold heading and <h2>……</h2> is used to add a smaller one…..etc

6. <h6>……. </h6>

This code is used to add the smallest heading.

7.
```
<table style="width:100%">
  <tr>
    <th>……</th>
    <th>……</th>
    <th>……</th>
  </tr>
  <tr>
    <td>……</td>
    <td>……</td>
    <td>……</td>
  </tr>
</table>
```

This code is used to add a table in html.

References

1) https://www.britannica.com/technology/computer-architecture
2) https://edu.gcfglobal.org/en/computerbasics/what-is-a-computer/1/
3) https://www.partitionwizard.com/clone-disk/memory-vs-storage.html
4) https://www.opennaukri.com/input-and-output-devices/
5) https://www.techwalla.com/articles/the-importance-of-a-motherboard-in-a-computer
6) https://www.computersciencedegreehub.com/faq/what-is-computer-architecture/