What is Computer?

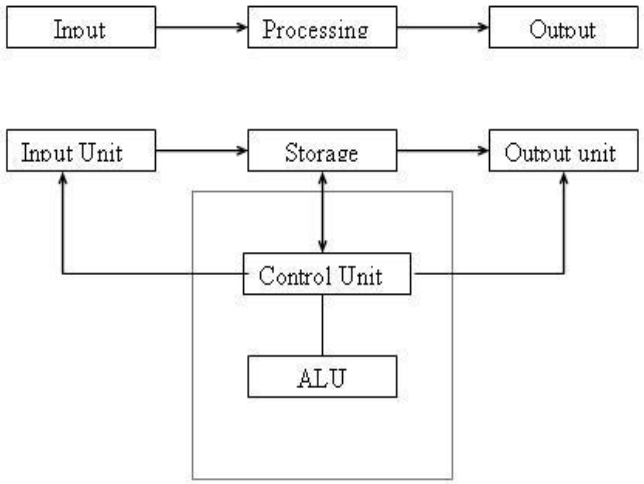
A Computer is an electronic device that can perform a variety of operations in accordance with a set of instructions called program.

Units of Computer:-

1. **Input Unit**: - By using this unit we can enter the data or information in the computer system.
2. **Processing Unit**: - In this unit the entered data are processed.
3. **Memory Unit**: - In this unit the processed data or information's are stored.
4. **Output Unit**: - By using this unit we can see or we can get output.

Input Devices are:-

1. Keyboard
2. Mouse
3. Joystick
4. Light Pen
5. Scanner
6. Digital Camera
7. Bar Code Reader
8. Graphics Tablet
9. Microphone
10. Magnetic Ink Character Reader (MICR)
11. Optical Character Reader (OCR)
12. Optical Mark Reader (OMR)
13. Smart Card Reader
14. Biometric Sensors
15. Web Camera (Webcam)



Block Diagram of Computer

Output Devices are:-

1. Printers
2. Monitors
3. Speakers
4. LCD Projectors
5. Plotters

Printers: - a printer is a peripheral device which makes a persistent human-readable representation of graphics or text on paper

Two types of Printer

1. Impact Printers: - There is mechanical contact between the printer head and paper. (Exp- Dot matrix, Drum Printers etc.)
2. Non-Impact Printers: - There is no mechanical contact between the printer head and paper. (Exp- Inkjet, Laser Printers)

CPU (Central Processing Unit): - This is generally known as Brain of the Computer. It is divided into three parts-

1. CU (Control Unit):- It directs and controls entire computer system to carry out stored program instructions.
2. ALU (Arithmetic and Logic Unit):- It executes arithmetic and logical operations, like addition, subtraction, multiplication, division, comparison etc. It also uses other logical operators like AND, OR, NOT.

3. MU (Memory Unit):- The memory unit is the part of the computer that holds data and instructions for processing. Memory unit has two sub-units, these are-

   Primary Memory: - Memory associated with the CPU is called primary memory (or primary storage). It is also known as Main Memory. It is further divided into two sections-
   1. **RAM (Random Access Memory)**:- This is really main store and is the place where the programs and software we load, get stored. If the CPU needs to store the result of calculations it can store them in RAM.
   2. **ROM (Read Only Memory)**:- The CPU can only read instructions from ROM. It comes with instructions permanently stored inside and these instructions cannot be overwritten by computer's CPU. ROM memory is used for storing special sets of instructions which the computer needs when it starts up.

   Secondary Memory: - It is also called auxiliary storage. It is more permanent than the main memory, as data and programs are retained when the power is turned off. A variety of **Secondary Storage Devices** are available, that are-
   1. Hard Disk
   2. Floppy Disk
   3. CD-ROM (Compact Disk-Read Only Memory)
   4. DVD (Digital Video Disk)
   5. Pen Drive
   6. Flash Memory
   7. Smart Cards

Strengths and Weaknesses of Computer:-

There are some big Advantages or Strengths of Computers:-

1. ***Speed***: - Computers are much faster as compared to human beings. A computer can perform a task in a minute that may take days if performed manually. A modern computer can execute millions of instructions in one second.
2. ***High Storage Capacity***: - Computers can store large amount of information in very small space. Bubble memories can store 6,250,000 bits per square centimeter of space.
3. ***Accuracy***: - Computers can perform all the calculations and comparisons accurately provided the hardware does not malfunction.
4. ***Reliability***: - Computers are immune to tiredness and boredom or fatigue. Thus are more reliable than human beings.
5. ***Versatility***: - Computers can perform repetitive jobs efficiently. They can solve labour problem or do hazardous jobs in hostile environment. They even can work in the areas where human brain can err for instance observing motion of very fast moving articles. Also they can work with different types of data and information like graphic, audio, visual, characters etc.

Inspite of having all the above given characteristics, it does possess some limitations also that are strengths of human beings. These are:

1. ***Lack of Decision Making Power***: - Computers cannot decide on their own. They do not possess this power which is a great asset of human beings.
2. ***IQ Zero***: - Computers are dumb machines with zero IQ. They need to be told each and every step, however minute it may be.

These limitations of computers are characteristics of human beings. Thus, computers and human beings work in collaboration to make a perfect pair.

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THE GENERATIONS OF MODERN COMPUTER

The term ***'Computer Generation'*** is often used in relation to the hardware of computers. Each phase of computer development is known as a separate generation of computers. Each phase of development is characterized by type of switching circuits it utilizes.

The First Generation Computers (1949-1955):-

The first Generation computers used thermionic valves (Vacuum Tubes) and machine language was used for giving instructions. The first generation computers used the concept of 'Stored Program'. The computers of this generation were very large in size and their programming was difficult task. Some computers of this generation are being given below:-

ENIAC: - This was the first electronic computer developed in 1946 by a team lead by Prof. Eckert and Mauchly. This computer called ***Electronic Numerical Integrator And Calculator*** used high speed vacuum tubes switching devices. It has very small memory and it was used for calculating the trajectories of missiles. It took 200 microseconds for addition and about 280 microseconds for multiplication. This giant machine was 30x50 feet long, weight 30 tons, contained 18,000 vacuum tubes, 70,000 resistors, 10,000 capacitors, 6000 switches, used 150,000 watts of electricity, and cost $ 400,000. When ENIAC was built, it was 5000 times faster than the closest competitor, the Howard MARK-I.

Some key features of first generation computers are:

- ⇨ Used vacuum tubes
- ⇨ Big and clumsy computers
- ⇨ Electricity consumption high
- ⇨ Electric failure occurred regularly – computers not very reliable
- ⇨ Large air conditioners were necessary because the computers generated heat
- ⇨ Programming in machine language

The Second Generation Computers (1956-1965):-

The second generation computer used the **"Transistors"** in place of **"Vacuum Tubes"** and **"Magnetic Disk"** storage devices. These new developments made these computers much more reliable.

The increased reliability and availability of large memories paved the way for the development of high level languages (HLL) such as FORTRAN, COBOL, ALGOL and SNOBOL etc.

Some second generation computers:-

IBM 1401, IBM 1620, IBM 7094, CDC 1604, CDC 3600, RAC 501, UNIVAC 1108.

Some key features of second generation computers are:-

- ⇨ Transistor replaced vacuum tube
- ⇨ Computers became smaller
- ⇨ Generated less heat
- ⇨ Electricity consumption lower
- ⇨ More reliable
- ⇨ Faster
- ⇨ Core memory developed
- ⇨ Magnetic tapes and disks used
- ⇨ First operating systems developed
- ⇨ Programming in machine language as well as assembly language

The Third Generation Computer (1966-1975):-

The third generation computers replaced **Transistors** with **"Integrated Circuits"** known popularly as **"Chips"**. The **"Integrated Circuit"** or **I.C.** was inverted by Jack Kilby at Texas instruments in 1958.

Examples of some main-frame computers developed during this generation are:
IBM-360 series, ICL-1900 series, IBM-370/168, ICL-2900, Honeywell Model 316 series

Some mini computers developed during this phase are: ICL-2903 manufactured by International Computers Limited, CDC-1700 manufactured by Control Data Corporation and PDP-11/45 (Personal Data Processor-11/45)

Some key features of third generation Computers are:

- ⇨ Integrated Circuits developed
- ⇨ Computers smaller, faster and more reliable
- ⇨ Power consumption lower
- ⇨ High-level languages appeared

The fourth Generation Computer (1976-1990):

The advent of the microprocessor chip marked the beginning of the fourth generation computers. **"Medium Scale Integrated"** circuits (MSI circuits) yielded to **"Large and Very Large Scale Integrated"** (VLSI) circuits packing about 50000 transistors in a chip. Semiconductor memories replaced magnetic core memories. The emergence of the microprocessor (CPU on a single chip) led to the emergence of extremely powerful personal computers. Computer costs came down so rapidly that these found places in most offices and homes. The faster accessing and processing speeds and increased memory capacity helped in development of much powerful operating systems.

Some key features of fourth generation computers are:

- ⇨ Integrated circuits, smaller and faster
- ⇨ Micro Computer series such ad IBM and APPLE developed
- ⇨ Portable computers developed
- ⇨ Great development in data communication
- ⇨ Different types of secondary memory with high storage capacity and fast access developed

The Fifth Generation Computers (1990-Present):

Fifth Generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization. The key developments of fifth-generation computers are summed up as: **ULSI (Ultra Large Scale Integrations)**, Scalable Parallel computers etc.

Some key features of Fifth Generation Computers are:

- ⇨ Parallel-Processing – many processors are grouped to function as one large group of processor.
- ⇨ Superconductors – A superconductor is a conductor through which electricity can travel without any resistance resulting in faster transfer on information between the components of a computer.

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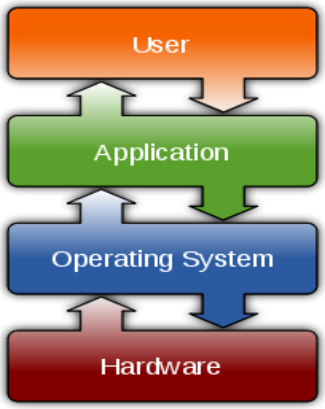
HARDWARE

The physical components of a computer are called **Hardware**. Physical components may be electronic, electrical, magnetic, mechanical or optical.
Example: - Keyboard, Mouse, Monitor, Printer, Plotter, Scanner, Hard disk, Floppy disk, Microprocessors etc.



SOFTWARE

A set of instructions to perform a particular task is called Program. The term **'Software'** refers to the set of computer programs that are needed for operating a computer system. Software can be categorized in to the following two categories:-

1. System Software
2. Application Software

System Software: - System Software is the program which is desired to control the operations of a computer system. This program manages the functions of a computer system and instructs the computer to perform tasks, such as controlling the operations, moving data in and out of a computer and executing application programs. This is divided into four parts-

1. Operating System
2. Compilers
3. Interpreters
4. Assemblers

Explanation of above points:-

Operating System: - It is a control program that runs the computer. It controls the flow of signals from the CPU to the other parts of a computer. When the computer is switched on, operating system is the first program loaded onto the computer's memory. MS-DOS, Windows and UNIX are some of the popular operating systems.

Compiler: - A compiler is a program which converts (or translates) a high-level language program into a machine language program. It translates the entire program into machine code at a time.

Interpreter:-An interpreter is a program which converts or translates statements one by one. It takes one statement of a high-level language program and translates it into machine code to be executed. It proceeds in this way till all the statements of the program have been translated and executed. An interpreter is slower than a compiler.

Assembler: - A program which translates an assembly language program into a machine language program is called as assembler.

Application Software: - An Application Software is a program designed to help its users in performing a certain type of work. Application software caters to one specific application. Application software is further classified into two parts:-

1. Packages
2. Utilities

Packages: - A Package is a computer application made up of one or more programs created to execute a particular type of work. Examples-

1. Word Processors

2. Accounting Packages
3. Electronic Spreadsheets
4. Graphics and Presentation Packages
5. Database Management Systems

Utilities: **-** It is a program designed to perform maintenance work on the computer. Examples-

1. Backup
2. Anti-virus
3. Disk Defragmenter

FIRMWARE

In electronics and computing, "**Firmware"** is a term often used to denote the fixed, usually rather small, programs and/or data structures that internally control various electronic devices. Firmware is often refers to a sequence of instructions (software) that is substituted for hardware.

Firmware was developed to be used for micro-programs and low-cost micro-processors. Firmware allows for hardware updating without purchasing additional hardware. It can improve both performance and reliability of hardware devices such optical media writers like DVD, CD.

Computer software in conventional systems is supplied on storage media like floppies, tapes, disks etc. Today software is made available by many computer manufactures on read only memory (ROM) chips. This ROM chips can be easily plugged into the computer system and they form a part of the hardware. Such programs (software) made available on hardware are known as firmware.

Examples of Firmware are (BIOS) Basic Input/Output System which refers to the firmware code used by IBM so the hard drive; floppy disks and CD's can load and take control of a PC. Boot monitors, boot loaders and Boot ROM are all examples of firmware.

Typical examples of devices containing firmware range from end-user products such as remote controls or calculators, through computer parts and devices like hard disks, keyboards, TFT screens or memory cards, all the way to scientific instrumentation and industrial robotics, mobile phones, digital cameras etc., contain firmware to enable the device's basic operation as well as implementing higher-level functions.

1. ROMs (Read-Only Memory)
2. PROMs (Programmable Read-Only Memory)
3. EPROMs (Erasable Programmable Read-Only Memory)

Firmware in PROM or EPROM is designed to be updated if necessary through a software update. Among the latest uses of firmware found in IPods. Firmware keeps the IPod updated by notifications from iTunes. Firmware is found in Apple, Mac, IBM, Dell and all other computer systems and other hardware devices.

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CLASSIFICATION OF COMPUTERS

The computers have been classified into three categories according to the Logical Used, which are:-

1. Digital Computers
2. Analog Computers
3. Hybrid Computers

Explanation: -

1. DIGITAL COMPUTERS: - Computers which are in use today are digital computers. They manipulate numbers and operate on binary digits 0 and 1. They understand information composed of only 0's and 1's. In the case of alphabetic information the alphabets are coded in binary digits. Example-

(a) Personal Computers

(b)Score board that directly counts discrete values such as the time left to play and the score of each team.

Digital Computers can further be classified in two ways (Purpose Wise): -

- ⇨ **Special-purpose Computer**: - These types of Digital Computers are used for payroll, graphs, analysis, account, banking system etc.
- ⇨ **General-purpose Computer**: - These types of Digital Computers are used for a specific job like the computer installed in automobiles to control fuel, ignition and banking system etc.

2. ANALOG COMPUTERS: - The computers that operate on data which is in the form of continuously variable, physical quantity, is called an Analog Computer. Analog Computers were used to simulate certain systems. They were also used to solve differential equations.

These computers recognize data as a continuous measurement of a physical property. Their output is usually in the form of readings on dials or graphs. Voltage, pressure, speed and temperature are some physical properties that can be measured in this way.

3. HYBRID COMPUTERS: - Hybrid computer is a combination of an analog and a digital computer. Such a computer system utilizes the measuring capabilities of an analog computer and counting ability of a digital computer.

Size and Performance wise

1. Micro Computers
2. Mini Computers
3. Mainframe Computers
4. Super Computers

Explanation of above points: -

1. MICRO COMPUTERS: - A microcomputer is a low-cost, small, digital computer. It contains a Microprocessor as its CPU, a memory unit, an input device, and an output device. A **microprocessor** incorporates most or all of the functions of a computer's central processing unit (CPU) on a single Integrated Circuit (IC, or microchip). The first microprocessors emerged in the early 1970s and were used for electronic calculators, using Binary-Coded Decimal (BCD) arithmetic on 4-bit words. Affordable 8-bit microprocessors with 16-bit addressing also led to the first general-purpose microcomputers from the mid-1970s on. Microcomputer is based upon the mini computers, but it uses LSI Chips for memory and logic circuits.

2. MINI COMPUTER: - In terms of size and processing capacity, minicomputers lie in between mainframes and microcomputers. Minicomputers are also called mid-range systems or workstations. The term began to be popularly used in the 1960s to refer to relatively smaller third generation computers. They took up the space that would be needed for a refrigerator or two and used transistor and core memory technologies. The 12-bit PDP-8 (Personal Data Processor) minicomputer of the Digital Equipment Corporation was the first successful minicomputer. Mini Computer was designed exclusively for aerospace applications. It allows multiple users to work on them. Cost and processing power lies between Micro Computers and Mainframes.

3. MAINFRAME COMPUTERS: - Mainframe computers are very powerful, large general purpose computers. They are used where large amount of data are to be processed or very complex calculations are to be made and these tasks are beyond the computing capacity of minicomputers. They are used in research organizations, large industries, large business, and government organizations, bank and airline reservations where a large database is required.

The main function of these computers is that, they can be used for any type of application, as the memory capacity is high and they support a large number of peripheral units.

4. SUPER COMPUTERS: - A Supercomputer contains a number of CPUs which operate in parallel to make it faster. They are used for massive data processing and solving very sophisticated problems. They are used for weather forecasting, weapons research and development, rocketing, aerodynamics, atomic nuclear etc.

The processing speeds of supercomputer are reaching up to speeds well over 25000 million arithmetic operations per second. It supports all types of peripherals.

Supercomputers have limited use and limited market because of their very high price. They are being used in India at some research centers and government agencies, involving sophisticated scientific and engineering tasks.

Examples of supercomputers are: PARAM developed by C-DAC (Centre for Development of Advanced Computing) in Pune (India), CRAY 3 (developed by Control Data Corporation).

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APPLICATIONS OF COMPUTERS

Computer are finding wide applications in practically all fields of the modern society like offices, hospitals, industries, research, domestic appliances etc.

The important applications of the computers are: -

1. In Business such as accounts, pay roll personnel records, market research, management information systems etc.
2. In Banking such as error free calculations, quick processing, records of account holders etc.
3. In Research such as defense, space, communication and other scientific fields.
4. In Medicals such as diagnosis of diseases, preparation of patient records, research etc.
5. In Transportation like Air traffic control, Traffic signal control etc.
6. In Customer Services such as Railways and Airlines Reservations, Hotel Reservations, Enquiry Offices etc.
7. In Sports and Entertainment such as score board control, computer games, horoscopes etc.
8. In Textiles such as creation of fashion pattern, colour synthesis and shades etc,
9. In Industry such as Process & Production control, Inventory control etc.
10. In Election such as keeping records of voters, analysis of data etc.
11. In office automation systems such as word processing record keeping etc.
12. In Engineering such as Mathematical modeling and complex computation, design & drafting etc.
13. In Stock Market.
14. In Weather Forecasting.
15. In Education.

Operations on Windows OS:

1. **Creating a File:**
   Right click → select "New" option → select specified file type and click on it → give the name of file.

2. **Renaming a File:**
   Right click on the file → select "Rename" option and click on it → Give new name of the file and press "Enter" button.

3. **Creating a Folder:**
   Right Click → select "New" option → select "Folder" option and click on it → give the name of the Folder and press "Enter" button.

4. **Renaming a Folder:**
   Right click on the Folder → select "Rename" option and click on it → Give new name of the folder and press "Enter" button.

5. **Copy File or Folder:**
   Right click on the File/Folder → select "Copy" option and click on it → go the specified location where we want to copy that File/Folder and again "Right click" on the blank space → select "Paste" option and click on it.

6. **Delete File or Folder:**
   Select the File/Folder which we want to delete and "Right Click" on it → select "Delete" option and click on it. (If system asks for deletion then press "Yes")

Bit:

A **bit** or **binary digit** is the basic unit of information in computing and telecommunications; it is the amount of information stored by a digital device or other physical system that exists in one of two possible distinct states.

In computing, a bit can also be defined as a variable or computed quantity that can have only two possible values. These two values are often interpreted as binary digits and are usually denoted by the Arabic numerical digits 0 and 1.

Byte:

The *byte* is a unit of digital information in computing and telecommunications, that most commonly consists of "eight bits". Historically, a **byte** was the number of bits used to ***"encode a single character"*** of text in a computer and it is for this reason the basic addressable element in many computer architectures and for measurement unit of memory capacity.

Nibble:

In computing, a **nibble** (often **nybble**) is a four-bit aggregation, or half an octet. As a nibble contains 4 bits, there are sixteen (2^4) possible values, so a nibble corresponds to a single hexadecimal digit (thus, it is often referred to as a "hex digit" or "hexit").

ASCII Code:

ASCII stands for American Standard Code for Information Interchange. Computers can only understand numbers, so an ASCII code is the numerical representation of a character such as 'a' or '@' or an action of some sort. ASCII was developed a long time ago and now the non-printing characters are rarely used for their original purpose. ASCII was actually designed for use with teletypes and so the descriptions are somewhat obscure (easily understood).

ASCII being a 7 bit code offered 128 different combinations. It had 52 binary values for alphabets, both uppercase and lowercase, 10 for numerals and 66 for special characters. It was a big improvement over the BCD code and is still being implemented on all the computer systems.

BCD:

In computing and electronic systems, **binary-coded decimal** (**BCD**) (sometimes called **natural binary-coded decimal**, **NBCD**) or, in its most common modern implementation, **packed decimal**, is an encoding for decimal numbers in which each digit is represented by its own binary sequence. Its main virtue is that it allows easy conversion to decimal digits for printing or display, and allows faster decimal calculations. Its drawbacks are a small increase in the complexity of circuits needed to implement mathematical operations. Uncompressed BCD is also a relatively inefficient encoding—it occupies more space than a purely binary representation.

In BCD, a digit is usually represented by four bits which, in general, represent the decimal digits 0 through 9. Other bit combinations are sometimes used for a sign or for other indications (e.g., error or overflow).

0 = 0000
1 = 0001
2 = 0010
3 = 0011
4 = 0100
5 = 0101
6 = 0110
7 = 0111
8 = 1000
9 = 1001

Numbers larger than 9, having two or more digits in the decimal system, are expressed digit by digit. For example, the BCD rendition of the base-10 number 1895 is

0001 1000 1001 0101

The binary equivalents of 1, 8, 9, and 5, always in a four-digit format, go from left to right.

The BCD representation of a number is not the same, in general, as its simple binary representation. In binary form, for example, the decimal quantity 1895 appears as

11101100111

Recent decimal floating-point representations use base-10 exponents, but not BCD encodings. Current hardware implementations, however, convert the compressed decimal encodings to BCD internally before carrying out computations. Software implementations of decimal arithmetic typically use BCD or some other 10^n base, depending on the operation.

EBCDIC:

Extended Binary Coded Decimal Interchange Code (EBCDIC) is an 8-bit binary code for numeric and alphanumeric characters, used mainly on IBM mainframe and IBM midrange computer operating systems.

EBCDIC descended from the code used with punched cards and the corresponding six bit binary-coded decimal code used with most of IBM's computer peripherals of the late 1950s and early 1960s.

HISTORY: - EBCDIC was devised in 1963 and 1964 by IBM and was announced with the release of the IBM System/360 line of mainframe computers. It is an 8-bit character encoding, in contrast to, and developed separately from, the 7-bit ASCII encoding scheme. It was created to extend the existing binary-coded decimal (BCD) interchange code, or BCDIC, which itself was devised as an efficient means of encoding the two zone and number punches on punched cards into 6 bits.

Word:

In computer architecture, a word is a unit of data of a defined bit length that can be addressed and moved between storage and the computer processor. Usually, the defined bit length of a word is equivalent to the width of the computer's data bus so that a word can be moved in a single operation from storage to a

processor register. For any computer architecture with an eight-bit byte, the word will be some multiple of eight bits. In IBM's evolutionary System/360 architecture, a word is 32 bits, or four contiguous eight-bit bytes. In Intel's PC processor architecture, a word is 16 bits, or two contiguous eight-bit bytes.

A word can contain a computer instruction, a storage address, or application data that is to be manipulated (for example, added to the data in another word space). In some architecture, a double word or larger unit is required to contain an instruction, address, or application data. Typically, an instruction is a word in length, but some architectures support half word and double word-length instructions.

Unicode:

Unicode is an entirely new idea in setting up binary codes for text or script characters. Officially called the Unicode Worldwide Character Standard, it is a system for "the interchange, processing, and display of the written texts of the diverse languages of the modern world." It also supports many classical and historical texts in a number of languages.

Currently, the Unicode standard contains 34,168 distinct coded characters derived from 24 supported language scripts. These characters cover the principal written languages of the world.

Green IT Concepts:

Green computing, also called green technology, is the environmentally responsible use of computers and related resources. Such practices include the implementation of energy-efficient central processing units (CPUs), servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (e-waste).

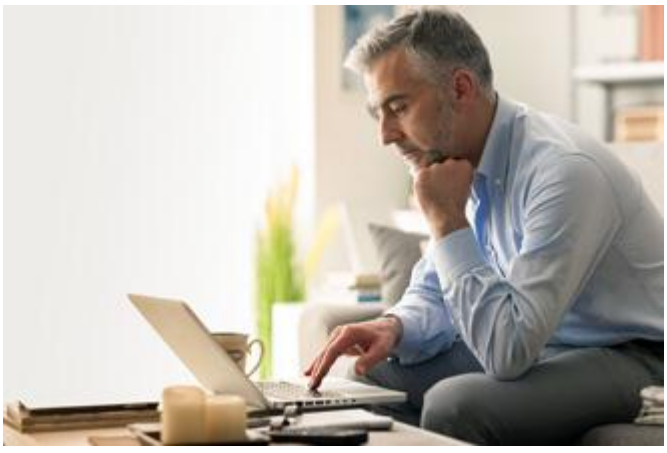
What Is "Computer Ergonomics"?

Ergonomics is the science of designing a job, equipment and/or workplace to fit the worker. The goal is to optimize the "fit" between each worker and his or her work environment to optimize performance and reduce the risk of repetitive strain injuries.

Computer ergonomics addresses ways to optimize your computer workstation to reduce the specific risks of computer vision syndrome (CVS), neck and back pain, carpal tunnel syndrome and other disorders affecting the muscles, spine and joints.

Some experts in this field also use the term "visual ergonomics" when talking about designing a computer workstation with the goal of preventing CVS.

Here are some of the top computer ergonomics tips recommended by the U.S. Department of Labor's Occupational Safety & Health Administration (OSHA). These tips are designed to reduce the risk of stress, physical injury and computer eye strain from prolonged computer use.



With better posture, this computer worker might avoid neck and back strain.

1. Sit so your head and neck are upright and in-line with your torso, not bent down or tilted back.
2. Face your computer screen directly. Avoid viewing your screen with your head turned or your back twisted.
3. Keep your elbows comfortably close to your body.
4. Use a chair that provides support for your lower back and has a cushioned seat with a contoured front edge.
5. Keep your mouse close to your keyboard so you don't have to reach for it.
6. Position your computer display so the top of the screen is at or slightly below eye level. This will allow you to view the screen without bending your neck.
7. Adjust the position of your display to prevent reflections of overhead and outdoor lighting appearing on your screen.
8. Put your monitor close enough to your eyes so you can comfortably read text on the screen without leaning forward.
9. When working with print documents, use a document holder that positions them at the same height and distance as your computer screen.
10. Use a hands-free headset when talking on the phone while working at your computer.

Also, adjust the height of your chair and desk so that:

- Your upper arms are perpendicular to the floor, not stretched forward or angled backward
- Your forearms, wrists and hands form a 90-degree angle with your upper arms
- Your thighs are parallel to the floor and your lower legs are perpendicular to the floor
- Your wrists and palms are not resting on sharp edges

Power Plans to maximize computer's performance and conserve energy:

A "power plan" is simply a collection of settings in Windows that determine how certain features operate. Plans are available on any Windows PC by doing a desktop search for "power plan" and selecting "choose a power plan," but they're more important and easier to find on systems with a battery. Any Windows rig that has a battery will also have a battery icon in the system tray that can be used to access power plan settings.

By default a Windows system will offer three default power plan options; maximum performance, balanced and power saver. Manufacturers occasionally add their own plans, as well. You can switch between plans at any time, change them however you'd like, and create new plans by clicking the "Create a power plan" link on the left side of the Power Options window.

1. Use Lower Power Mode Level

The Windows performance power slider enables you to quickly and intelligently trade performance of your system for longer battery life. Setting the power mode level to **Battery Saver** or **Better Battery** while running on battery power can help extend your PC's battery life.

- **Battery Saver** - Helps conserve power, and prolong battery life, when the system is not connected to a power source. When battery saver is on, some Windows features are disabled, throttled, or behave differently. Screen brightness is also reduced. Battery Saver is only available on DC.
- **Better Battery** - Delivers longer battery life than the default settings on previous versions of Windows. Available on both AC and DC. In some cases, users will see this mode labeled Recommended, rather than Better Battery, in their slider UI.

2. Choose a Power Plan that Saves More Energy

A power plan is a collection of hardware and system settings that manages how your computer uses power. Power plans can help you save energy, maximize system performance, or achieve a balance between the two. Selecting to use the **Balanced** or **Power saver** power plan can help extend your PC's battery life.

- **Balanced** - Offers full performance when you need it and saves power when you don't. This is the best power plan for most people.
- **Power saver** - Saves power by reducing PC performance and screen brightness. If you're using a laptop, this plan can help you get the most from a single battery charge

3. Reduce Screen Brightness Percentage Level

A brighter display uses more power, which reduces battery life. You can reduce the screen brightness to the lowest percentage level (ex: 50%) acceptable to you while running on battery power to help extend your PC's battery life.

4. Turn On and Adjust Battery Saver

Battery saver extends battery life by limiting background activity and push notifications when your device is low on battery. When battery saver is on, your PC temporarily turns off some things that use a lot of power, like automatic email and calendar syncing, live tile updates, and apps you're not actively using.

5. Run the Power Troubleshooter

The **Power** troubleshooter will automatically find and fix problems with your computer's power settings to conserve power and extend battery life.

6. Reduce Time to Turn Off Display when on Battery Power

You can specify how long your PC is inactive before the display (screen) automatically turns off. Using a shorter duration will help extend your PC's battery life.

7. Reduce Time for when PC Sleeps when on Battery Power

Sleep uses very little power, your PC starts up faster, and you're instantly back to where you left off. Using a shorter duration will help extend your PC's battery life.

8. Manage Battery Usage by App

Get the most out of your PC's battery by choosing which apps are okay to run in the background. **See which apps are affecting your battery life** allows you to see a list of apps and how much battery each one is using relatively. This can help you choose which apps to allow (the ones you care about most) versus which apps to disallow (the ones you care about least). Select an app from the list, and then clear the Let Windows decide when this app can run in the background check box. (Note that some apps can't be changed.)

9. Turn Off Bluetooth

Bluetooth is a short range wireless technology which enables wireless data transmission between two Bluetooth enabled devices located nearby each other. If you don't use Bluetooth (if available), then turning it off will help extend your PC's battery life.

10. Turn On Airplane Mode to Disable All Wireless Communication

Airplane mode is a feature that gives you a quick way to turn off all wireless communication on your PC. As the name implies, it's especially useful when you're on an airplane. Wireless communication includes Wi-Fi,

cellular (mobile broadband), Bluetooth, GPS or GNSS, near field communication (NFC), and all other types of wireless communication.

11. Change Power Saving Mode of Wireless Adapters when On Battery

The Power Saving Mode setting under Wireless Adapter Settings in Power Options allows you to control the power saving mode of wireless adapters.

12. Optimize Video Playback Quality for Battery Life

When watching movies and videos on battery power, you can choose **Optimize for battery life** for battery-saving options for playing video, such as allowing video to play at a lower resolution.

13. Optimize Streaming HDR Videos, Games, and Apps for Battery Life

When running Windows **HD Color** content on battery power, you can choose **Optimize for battery life** for battery-saving options, such as not allowing HDR games and apps on battery, or not allowing streaming HDR video to play on battery. (The specific options you have depend on the Windows HD Color capabilities that your device supports.)

14. Turn Off Location Service

Many Windows and third party apps and services request and use your device location information to provide you with convenient services, such as maps to help you get where you're going or a list of restaurants near you. Windows location settings give you control over which Windows apps can use your device location and location history information.

15. Unplug Your Unused Devices

If you have devices or accessories connected to your PC that you don't use, turn off your PC, unplug the devices, and then turn your PC back on.

16. Disable Indexing when on Battery Power

By default, Windows will use the index when searching to give you faster search results. If you like, you can enable a policy to pause indexing when your PC is running on battery power to conserve energy, and automatically resume indexing when your PC is running on AC power next.

17. Use Longer Interval to Sync Email

Increase battery life by changing how frequently your PC syncs email by selecting a longer interval to download new content.

Carbon Footprint

A carbon footprint is a gauge of the measured output units of carbon dioxide (CO_2) and methane (CH_4) for a particular individual, product, practice or organization as it applies to environmental impact. Carbon footprint is most commonly expressed in metric tons per year. Historically, carbon footprint was an intended measure of all emissions but in its expression, it is converted to CO_2.

A carbon footprint is an important measure of the environmental impact of carbon dioxide and methane's contributing factors to man-made climate change in the form of greenhouse gases, also known as global warming.

A carbon footprint is composed of two parts, a primary and secondary footprint. The primary footprint is the sum of the direct carbon dioxide emissions of burning of fossil fuels, such as the domestic energy consumption by furnaces and waters heaters, and transportation, such as automobiles and airplane travel. The secondary footprint is the sum of indirect emissions associated with the manufacture and breakdown of all products, services and food an individual or business consumes.

E-WASTE

E-Waste comprises of the electronic products that are no longer useful to us. The e-wastes are dangerous, and on the basis of their condition and density the hazardous levels are marked. E-waste management has become a significant problem due to the technical prowess we have gained in the last century. Personal computers are an indispensable part of our lives, but they contain various toxic substances, such as toxic gases, chlorinated and brominated substances, toxic metals, acids, biologically active materials, plastics and plastic additives.

These substances are hazardous to the health and environment, as well. So, it becomes necessary to dispose off these e-wastes very cautiously.

E-WASTES DUE TO COMPUTER COMPONENTS

A life without computer cannot be imagined today. They are commonly used in offices, schools, colleges, residences and manufacturing industries. The computer components contain e-toxic substances of a broad range.

- Circuit Boards- these include heavy metals like lead and cadmium
- Batteries- these include cadmium
- Cathode ray tubes- they contain lead and barium oxide
- Brominated flame retardant in coated on circuit boards, cables, and PVC
- Copper cables and plastic coated computers release toxic dioxins and furan when burnt
- Flat screens contain mercury
- Old capacitors contain PCB

It has been estimated that 286,700 kg of mercury, about 4 kg of lead, 2.87 billion kg of plastic and 716.7 kg of lead are present in 500 million computers, in the world. These heavy metals like lead contaminate the ground water and when burnt produce harmful effects like the emission of toxic fumes in the atmosphere.

HEALTH HAZARDS OF COMPUTER COMPONENTS E-WASTE

Solder

This is present in circuit boards, glass panels, gaskets and computer monitors. Solder contain lead that damage the nervous system, blood system, kidney and also affect the development of brain in children.

1. **Chip resistors and Radium Conductors**

The cadmium present in these parts are dangerous to human because the toxins released cause neural damage and teratogenic effects in fetus.

2. **Relays, Switches and Printed Circuit Boards**

Mercury present in these elements leads to brain damage, disorders in the respiratory system and skin diseases.

3. **Corrosion Protectors**

Asthmatic bronchitis and DNA damage are caused due to the Hexavalent Chromium present.

4. **Cabling and Computer Housing**

When burn these produce dioxin, which causes problems of reproduction, destruction of the immune system, and regulatory hormones are damaged too.

5. **Circuit Boards**
   The endocrine system's functions are interrupted because of the Brominated Flame Retardants.
6. **Front panel of CRTs and Mother Board**
   Skin and heart diseases, muscle weakness, lung cancer, chronic beryllium diseases are caused because of the presence of Beryllium.

E-Waste Management and Recycling

It is estimated that 75% of electronic items are stored due to uncertainty of how to manage it. These electronic junks lie unattended in houses, offices, warehouses etc. and normally mixed with household wastes, which are finally disposed off at landfills. This necessitates implementable management measures.

In industries management of e-waste should begin at the point of generation. This can be done by waste minimization techniques and by sustainable product design. Waste minimization in industries involves adopting:

- inventory management,
- production-process modification,
- volume reduction,
- recovery and reuse.

Inventory management

Proper control over the materials used in the manufacturing process is an important way to reduce waste generation (Freeman, 1989). By reducing both the quantity of hazardous materials used in the process and the amount of excess raw materials in stock, the quantity of waste generated can be reduced. This can be done in two ways i.e. establishing material-purchase review and control procedures and inventory tracking system.

Developing review procedures for all material purchased is the first step in establishing an inventory management program. Procedures should require that all materials be approved prior to purchase. In the approval process all production materials are evaluated to examine if they contain hazardous constituents and whether alternative non-hazardous materials are available.

Production-process modification

Changes can be made in the production process, which will reduce waste generation. This reduction can be accomplished by changing the materials used to make the product or by the more efficient use of input materials in the production process or both. Potential waste minimization techniques can be broken down into three categories:

i) Improved operating and maintenance procedures,
ii) Material change and
iii) Process-equipment modification.

Volume reduction

Volume reduction includes those techniques that remove the hazardous portion of a waste from a non-hazardous portion. These techniques are usually to reduce the volume, and thus the cost of disposing of a waste material. The techniques that can be used to reduce waste-stream volume can be divided into 2 general categories: source segregation and waste concentration. Segregation of wastes is in many cases a simple and economical technique for waste reduction. Wastes containing different types of metals can be treated separately so that the metal value in the sludge can be recovered. Concentration of a waste stream may increase the likelihood that the material can be recycled or reused. Methods include gravity and vacuum filtration, ultra filtration, reverse osmosis, freeze vaporization etc.

For example, an electronic component manufacturer can use compaction equipments to reduce volume of waste cathode ray-tube.

Recovery and reuse

This technique could eliminate waste disposal costs, reduce raw material costs and provide income from a salable waste. Waste can be recovered on-site, or at an off-site recovery facility, or through inter industry exchange. A number of physical and chemical techniques are available to reclaim a waste material such as reverse osmosis, electrolysis, condensation, electrolytic recovery, filtration, centrifugation etc. For example, a printed-circuit board manufacturer can use electrolytic recovery to reclaim metals from copper and tin-lead plating bath.

However recycling of hazardous products has little environmental benefit if it simply moves the hazards into secondary products that eventually have to be disposed of. Unless the goal is to redesign the product to use nonhazardous materials, such recycling is a false solution.

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