

**1.Our University: brief historical survey**

The early history of the University began on the 8th of December, 1859, when the Gory-Goretsky Agricultural Institute welcomed the first students of the Forestry program. Forestry faculties were established in 1919 at the Gory-Goretsky Agricultural Institute and in 1920 in Minsk Polytechnic Institute. They further became a basis for the foundation of the Forestry Institute in Gomel on June 1, 1930.

In 1934 the Forestry Institute was renamed into the Belarusian Forestry Engineering Institute. In 1941 at the beginning of the Great Patriotic War the Institute was evacuated to the city of Sverdlovsk and became a part of the Ural Forestry Engineering Institute. After liberation of Gomel from German fascist invaders the Institute was re-evacuated to Gomel. In August 1946 the Institute was transferred to Minsk. Its reformation in 1961 into the Belarusian Technological Institute was inspired by an intensive development of the Republic’s chemical industry.

Real flourishing of the Technological Institute started at the end of the 80s and was brought about by intensive development of science. In 1993 it was renamed into Belarusian State Technological University. The scope of the University competence has enlarged dramatically. The University began training specialists for the careers in landscape architecture, glass and glass ceramics production, chemical sources of current and functional electroplating, polymer and mould products design, industrial ecology, bio-ecology, certification, automation of 34 technological processes, biotechnology of energy carriers, fine organic synthesis, medicines, information systems and technologies, management, marketing, tourism and nature management, etc.

The Belarusian State Technological University was granted the status of a leading higher educational institution in the fields of forestry and forest industry. In 2011 the BSTU was accredited as research organization and became a member of Belarusian-Kazakhstan educational-scientific consortium. In 2012 the University was reorganized into an educational, research and production centre in line with lifelong learning principles.

**2.Our University: scientific and research work.**

The BSTU is a big scientific and research centre actively developing fundamental and applied research trends. The University **focuses on high quality research** that has the potential to **have an influence on the real world around us**. Research has central place in everything we do because it **integrates into our teaching process**.

The University **scientists are active participants of scientific and technical programs of various scope**. For example, over the last years they have participated into different **national and regional research and technical projects**. Now the University is a partner of the state research and technical program “**Monitoring**”, **international Belarusian-Lithuanian program**

The University researchers collaborate with over **400 international and national partners** within commercial research contracts. **The sphere of research** trends developed by the University is highly diverse, for example: organic and petrochemical synthesis, technology of building materials, glass and ceramics, synthesis, properties and application of nanomaterials , resource-saving electrochemical production, electronic engineering materials, chemical wood processing, biotechnology, medicinal drugs, industrial ecology, resource- and energy-saving processes and technology, printing and publishing technology and equipment, information systems and technology, information security software for mobile systems, design of electronic and web-publications.

Every year the University **researchers publish over 2,500 papers**. **Scientific journal “Proceedings of BSTU**”. The journal is published every year and welcomes contributions in Russian, Belarusian and English by international scientific community. Only for the past 5 years the University has been received more than 240 patents for inventions and useful models.

Over 88 international and republican conferences have been hosted by the BSTU.

**3. BSTU today(импровизация из первых 2-х). Student life**

Student life is the most exciting and challenging time for students to explore new horizons and set a course for the future. The Belarusian State Technological University gives the chance to make new friends and enjoy new hobbies or sports, to explore opportunities and gain experiences that can change your life.

The student campus **houses five dormitories** where students can rest and study. The dormitories are conveniently located within a walking distance from the University’s academic buildings and provide excellent opportunities to feel part of the community the students are joining. All rooms are equipped with modern furniture and facilities

The BSTU students are engaged in multiple interests. The student organizations in campus enrich the social, cultural and educational experiences of students. Students interested in the arts participate in a variety of visual and performing art groups, dance groups, choirs, student theatre. **Various festivals such** as “Student Spring”, “Student Autumn”, “Mother’s Day”, contests, meetings, discotheques, sport events in six kinds of sports are arranged at the dormitories. **Students go in for football, volleyball, basketball and other sports**. There are international club “Unity” and a **room for social activities at the campus;** students can develop their **creative individual abilities in such groups as “Magical Needles”, “Needlewoman”, “Do It Yourself”, “Golden Boat”, “Hostess**”, the club of decorative arts, etc.

It’s hard to imagine student life without sport. The University possesses a modern **sports complex with a gym for team sports, wrestling, eurhythmics and aerobics, medical gymnastics, as well as a stadium with running tracks, football grounds, 2 tenniscourts, basketball and 4 volleyball-courts with synthetic covering**. Among the BSTU students there are winners of the international competitions and world championships. **The University teams** in chess, arm-wrestling, weight lifting have repeatedly become prize winners of national student competitions. University sport club comprises such sport groups as: swimming, athletics, tourism, football, unarmed combat, Greco-Roman wrestling, sambo, karate, judo, volleyball, table tennis, basketball, arm-wrestling, and weight lifting. The Student Union organizes numerous events for students every year; they invite students to experience new places and countries, to join students’ volunteering network and to engage in various activities. Youth student leisure centre unites creative students and helps to reveal their abilities in the club of intellectual games, in artistic groups, social events, discotheques. The youth information group and a number of volunteer teams are working successfully at the University.

**4.Science and technology: the importance of inventions to the progress of humanity.**

Modern civilization is everything that has been appeared thanks to science. science is very important and that **it develops our world**. Science is **systemized knowledge** that **we have through experimentation**, observation, and study. In its widest sense **it is formulated knowledge, knowledge of structure, laws, and operations.**

Today, **science and technology are closely related.** Many **modern technologie**s such as nuclear power and space flights **depend on** science and the application of scientific knowledge and principles. Each advance in pure science creates new opportunities for the **development of new ways of making things** to be used in daily life.

Throughout human history, men and women have invented tools, machines, materials and techniques, to make their lives easier.

Of course, **when we speak of technology today, we are looking at it in a much narrower sense**. Generally, we mean **industrial technology**, or the technology that began about 200 years ago with the development of power-driven machines, growth of the factory system, and mass production of goods that has created the basis for our modern society. **Today we often say that we live in an age of science and technology**. According to one estimate, 90% of all the scientists who ever lived, were alive and active in **the 1970-**s. **This increased scientific activity has brought new ideas, processes, and inventions in ever-growing amount**.

**The scientific revolution that** **began in the 16th** century was the first time that **science and technology began to work together**. Thus, **Galileo,** who made revolutionary **discoveries in astronomy and physics**, also built an improved telescope and patented **a system of lifting water**. However, it was not until the 19th century that technology truly was based on science and inventors began to build on the work of scientists. For example, **Thomas Edison b**uilt on the early experiments of Faraday and Henry in his **invention of the first practical system of electrical lighting**. So too, Edison carried on his investigations until he found the carbon filament for the electric bulb in a research laboratory. This was the first true modern technological research.

In a sense, the history of science and technology is the history of all humankind.

**5.Science and technology: inventions, famous scientists and inventions.**

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The **seventeenth century** saw the development of scientific thinking on entirely new scale. **Scientific ideas were tested by experiments**. **Isaac Newton** developed the theory of Gravity in 1687. Robert Boyle and Robert Hooke in 1628 led to great advances in medicine and in the study of the human body.

**The nineteenth and twentieth centuries** are notable for the discoveries and inventions which were **a real breakthrough in the world science**. Among them are the discovery of the law of chemical elements by **Dmitry Mendeleev** in 1869; of the invention of the telephone by **Alexander Bell** in 1876; the invention of the electric light bulb by **Thomas Edison** in 1879; the invention of a petrol driven car by **Karl Benz** in 1885; the discovery of radium made by **Marie Curie** in 1911; the invention of radio by Alexander Popov; the first practical helicopter built up by Igor Sikorski; the invention of television in 1926; the discovery of penicillin by **Alexander Fleming** in 1928; the discovery of nuclear fission by Lise Meitner in 1939 and many others.

**Scientific discoveries and inventions were made** by outstanding people like Leonardo de Vinci, Galileo, Newton, Lomonosov, Edison, Einstein. In most cases the genius of the scientist played the decisive role in creating the **invention or discovery of scientific laws.**

**Isaac Newton**

Isaac Newton was one of the world’s **greatest scientists.** He did research in **mathematics, physics, astronomy and many other fields**. Newton was born in **1642.** He worked on **his family’s farm** but was not really interested in farming. His father died before Isaac was born. In his childhood he spent much time with his **grandmother**. Newton didn’t have many friends and never married.

Newton **was an astronomer**, who studied the Earth, the planets and stars. He became well-known **for theories of gravity**. He also showed that planets **move around the sun in ellipses**. His theory of **gravity dominated physics for some time**.

He also **has experiments with light and found out that normal light is made up of many color**s. He used prisms to break up **light into a rainbow of colors**. Newton invented a **new kind of telescope** that used lenses. It made objects look bigger.

**Albert Einstein**

**Albert Einstein** was a famous scientist who completely **changed the way that people saw our world and the universe**. Einstein created many theories which **proved that things like gravity, light**, energy and matter were connected with each other. At first, very **few scientists could understand Einstein’s** theories but as time passed other scientists showed that he was correct.

Albert Einstein was born in Ulm, **Germany in 1879** and grew up in Munich. He **wasn’t a good student at school** and only **did things he was interested in**, like science and mathematics. At the very early age young Albert started wondering about **the mysteries of the universe**.

He lived in Berlin for a long time and there he developed many of his scientific theories. In 1921 he **received the Nobel Prize for Physics**.

One of the most famous equations ever written came from Albert Einstein: **E = mc2.**

**6.Information Technology Industry in Belarus**

In the past several years Belarus has had the reputation of the **leading “IT country” in the Europe**. According to the **Global Services 100 rating**, the Republic of Belarus placed **13th among the 20 leading countries in the sphere of IT** high-tech services. Moreover, **three belarusian companies entered the top-100 of the largest world companies in this sphere**: **EPAM Systems, IBA Group and Intetics Co.**

**Software** development has existed in the country **since 1998.** However, the key “point of reference” from which the development of the IT sphere in Belarus began is considered to **be September 2005**, when by the Decree of the President of the Republic of Belarus №12 “On HTP”, the legal basis for the **successful work of the “Belarusian Silicon Valley**” – the High-Tech Park – and the attraction of investments to the software development industry was laid.

Today Belarusian **companies working within the HTP, differ by the progressive management** and the effectiveness of marketing decisions. The sphere is characterized by client maturity, the complexity of the implemented projects, the global network of service delivery, the variety of the “portfolio” of products and services, the ability to work on the niche markets.

**Achievements of the Belarusian High-Tech Park**

In September 2012, HTP announced about the first 1 billion US dollars earned. And by 2020, according to estimates, this amount will be transferred to the budget from the HTP residents annually. According to the International Finance Corporation, by 2020 the revenue of the IT-sphere of Belarus may reach 3-4 billion US dollars, or 4.5% of the total GDP of 2012. About 6 thousand workplaces have been created during the existence of the Park with the participation of foreign investors.

Today 49% of HTP residents are companies with Belarusian capital and 51% — with foreign capital. Experts predict an increase in the number of companies with foreign capital, as today ICT is one of the priority aspects for direct foreign investments to Belarus.80% of the software produced in the Park is exported. 45% is supplied to USA and Canada, 30% — to Europe, 20% — to Russia and CIS.

Belarus occupies the leading positions in Central and Eastern Europe in the export volume of computer and information services per capita. This figure amounted to over 35 US dollars per person in 2012. The indicator of Belarus exceeds the identical indicators in Russia and Ukraine by two or more times.

**Successful projects**

Information and communication technologies are also in the priority areas, which will attract investments. The number of companies in Belarus, producing intelligent products which are in demand around the world, is growing rapidly.

In 2011, the massively multiplayer online game [World of Tanks](http://worldoftanks.com/), developed by the Belarusian studio [Wargaming.net](http://wargaming.net/), has set a record, officially registered in Guinness Book of Records. The MMO-shooter managed to gather together the greatest number of players in history on the same server — more than 90.000 people. By the end of 2012 the authors of World of Tanks received a USD 200 million profit.

Belarusian developers have also strong positions in the categories of applications for communication. For example, the authors of the popular program [Viber](http://www.viber.com/), competing with Skype in the mobile market are Israelis. The main office of the company is located in Israel, the product is enjoyed by over 100 million people worldwide. However, all Viber software development is implemented in Belarus. The main advantages of Belarusian programmers are: the company allocates the capacity to think and act not by the book, but to find non-trivial solutions.

[EPAM Systems](http://www.epam.com/) is one of the key-players of the belarusian IT-industry. Established in 1993, EPAM Systems provides complex software engineering solutions through its award-winning Central and Eastern European service delivery platform. Headquartered in the United States, EPAM serves clients worldwide from its locations in the United States, Canada, UK, Switzerland, Germany, Sweden, Belarus, Hungary, Russia, Ukraine Information and communication technologies are also in the priority areas, which will attract investments. The number of companies in Belarus, producing intelligent products which are in demand around the world, is growing rapidly.

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EPAM Systems is one of the key-players of the belarusian IT-industry. Established in 1993, EPAM Systems provides complex software engineering solutions through its award-winning Central and Eastern European service delivery platform. Headquartered in the United States, EPAM serves clients worldwide from its locations in the United States, Canada, UK, Switzerland, Germany, Sweden, Belarus, Hungary, Russia, Ukraine, Kazakhstan, and Poland.

EPAM is ranked #6 on the 2013 Forbes “America’s 25 Fastest-Growing Tech Companies” list and is recognized among the leaders in software product development services by Forrester and Zinnov analysts., Kazakhstan, and Poland.

**7. Information Systems and Technologies , types of computers, positive and negative impact of IT.**

Information technology (IT) is the application of computers to store, study, retrieve, transmit, and manipulate data, or information, often in the context of a business or other enterprise. IT is considered as a subset of information and communications technology (ICT).

The term IT is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephones. Several industries are associated with information technology, including computer hardware, software, electronics, semiconductors, internet, telecom equipment, and e-commerce.

The term IT in its modern sense first appeared in a 1958.

The conception of IT is closely associated with Information Systems. IT deals with the technology involved in the systems themselves, e.g. an information system contains many information technologies such as servers, server operating systems, web server software etc.

There are such types of computers as PC, Desktop, Laptop, Tablet Computers, Smartphones, Workstation, Server, Supercomputer.

**PC.** A single person defines the personal computer, or PC, as any computer designed for general use by one person.

**DESKTOP.** A PC that is not designed for portability is a desktop computer.

**LAPTOP.** Also called notebooks, laptops are portable computers that mix the display, keyboard, a pointing device or trackball, processor, memory and hard drive all in a battery-operated package slightly larger than an average hardcover book.

**TABLET COMPUTERS.** Tablet Computers are ultra-portable computers that are even smaller than traditional laptops.

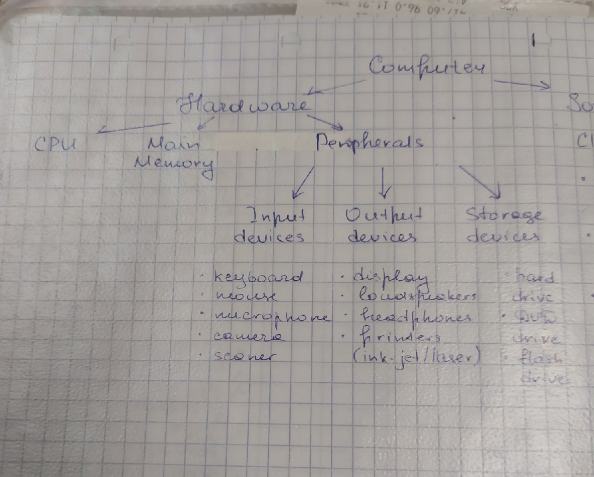
**SMARTPHONES.** Smartphones are handheld-sized computers that often use flash memory instead of a hard drive for storage.

**WORKSTATION.** Another type of computer is a workstation. A workstation is simply a desktop computer that has a more powerful processor, additional memory.

**SERVER** A computer that has been optimized to provide services to other computers over a network.

**SUPERCOMPUTER** This type of computer usually costs hundreds of thousands or even millions of dollars. Although some supercomputers are single computer systems, most are composed of multiple high-performance computers working in parallel as a single system.

**8. Computer essentials**

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A computer is a complex machine that is capable of performing huge computations at an extraordinary speed. Its processing power is often compared to that of human brain. Although human intellect is the undoubted winner in this competition, the capabilities of a computer cannot be underestimated. This complex machine influenced from the design of a human brain, mainly consists of a processing unit, an arithmetic/ logic unit, computer storage, and input/ output devices along with its peripherals. All the parts make the whole system.

Central Processing Unit (CPU): Also known as the computer processor, The CPU is an electronic circuit that executes computer programs. The primary responsibility of a computer processor is to execute a sequential set of instructions that constitute a program.

CPU operation can be divided into four basic steps, namely, fetch, decode, execute, and writeback. During the fetch step, the processor retrieves program instructions from memory. In the decode step, the instruction is broken down into parts. The instruction set architecture of the CPU defines the way in which an instruction is decoded. In the execute step, CPU performs the operation implied by the program instruction. During the writeback step the CPU writes back the results of execution to the computer’s memory.

Motherboard: A computer motherboard consists of sockets in which microprocessors are installed, memory slots, a chipset that acts as an interface between the CPU bus and the peripheral buses (a bus connects all the internal parts of a computer) , non-volatile memory chips housing the system’s firmware and a clock generator, which helps in the synchronization of various system components. Some motherboards also include logic and connectors to support input devices like PS/2 connectors for a mouse and keyboard.

Hard Disk: A hard disk is described as a part of the computer – which stores data and provides computer users with quick access to large amounts of data. A hard disk is an electromagnetically charged surface or a set of disks that record data in concentric circles known as tracks. It is a non-volatile storage device that stores digitally encoded data. The hard disks of desktops are generally capable of storing 120 GB to 200 TB of data. Laptop hard disk drives are smaller and have lower data storage capacities.

Computer Memory: It refers to those components of a computer, which retain digital data. It forms the core of a computer and makes up the basic computer model in collaboration with the CPU. Random Access Memory, popularly known as RAM, is a small-sized light and volatile form of computer memory. It is capable of temporary storage of data. Registers located in a computer processor are the fastest forms of computer storage. The most frequently used information is duplicated in the processor cache of a computer, thereby improving its performance. Computers require a non-volatile primary storage to read large programs. This non-volatile memory is known as ROM or Read-only memory. It also contains the startup programs used for bootstrapping a computer. Secondary storage media such as flash memory, magnetic tape, punch cards – are also a part of computer memory.

Monitor: A visual display unit, as it is called, is an electrical equipment that displays images generated by the video output device of a computer. Modern computer monitors use LCD or even plasma screens. The display provides computer users with instant feedback in the form of text and graphic images. Monitors are the most-used output devices of a computer.

Keyboard: A keyboard is regarded as an input device for a computer. With respect to the arrangement of keys, a computer keyboard is similar to a typewriter. The keys or buttons act as electronic switches with characters printed on them, with each keypress corresponding to a written symbol. A keyboard has its own processor and circuitry, which consists of a key matrix, which helps bring about the keyboard operation.

Mouse: A computer mouse is a pointing device that detects two-dimensional motion. There are three basic types of mice, namely, mechanical, opto-mechanical, and optical.

**9.The Development of Computers(generations), Artificial Intelligence.**

The history of computer development is divide into 6 generations. Each of the six generations become smaller, cheaper, more powerful than their predecessors. New discoveries are constantly being developed that affect the way we live, work and play.

*First generation (1940-1956): vacuum tubes.* The first computers used vacuum tubes and were often enormous, taking up entire rooms. They were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions. First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations, and they could only solve one problem at a time.

*Second generation (1956-1963): transistors.* Transistors replaced vacuum tubes and ushered in the second generation of computers. The transistor was invented in 1947 but did not see a widespread use in computers until the late 1950s. The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Second-generation computers moved to symbolic, or assembly languages, which allowed programmers to specify instructions in words. High-level programming languages were also being developed at this time, such as the early versions of COBOL and FORTRAN.

*Third generation (1964-1971): integrated circuits.* The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. Instead of punched cards and printouts, users interacted with the third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory. Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.

*Fourth generation (1971-1982): microprocessors.* The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. This generation of computers allows users to use the computer for word processing, spreadsheets, file managing and graphics.  The computer languages like C, C++, and DBase are used in this generation to perform the accurate operations. The concept of networking and CD-ROM came into existence in the fourth generation. As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet.

*Fifth generation (1982-present):* *artificial intelligence.* 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. Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come.

Now we use the*Fifth Generation of Computers*which were started around 1982. These generation computers use the high level of languages like Perl, Python, C, JAVA, etc.  Moreover, the Ultra Large Scale Integration technology was introduced in 5th generation computers which leads to the development of a microprocessor chip with several millions of chips on it.

It introduces the laptops, notebooks, PC’s, desktops, and many more during this period. Besides, these computers are based on Artificial Intelligence. The fifth-generation computers perform the parallel processing with fast results. In this generation of the computers, the new languages are introduced like object-oriented languages like C++, JAVA, etc. The new operating systems are developed MS Window, Linux.

Advantages of Fifth Generation of Computers. The fifth generation of the computer is much faster than fourth generation of computers. Whereas, these computers smaller and give fast results as compared with other generation computers. Moreover, these computers are portable so that, you can carry the devices anywhere and access at any time. Easy to handle these portable devices. With this generation computers, you can perform the multiple operations at a time with no slow down. The new version technologies are improved to repair the problems of computers. The fifth-generation computers introduce an improvement in semiconductor technology and Artificial Intelligence.

*Sixth Generation* of computers is different from, other generation computers in terms of size, speed and tasks that they perform. These computers are called intelligent computers based on artificial intelligence or artificial brains. Whereas, it uses the semiconductors as the raw material to its processors. Moreover, the sixth generation introduces the voice recognition which takes dictation and recognizes the words. By using the voice recognition, you can search and send the messages quickly and easily. Although people need to speak slowly and clearly to work properly. With the 6th generation computers, the complex problem solving is possible and researches are ongoing to find the ways to solve the problems more efficiently and easily.

*Future Generation Computers*may be neurons and attains the human level intelligence. We all have the image that the computer is a rectangular box either on desk or packet. We can think that computers are in cars or refrigerators. Whereas, you can operate the refrigerator with your phone or communicate with a light bulb. In fact, in the coming years, your light bulb will become the computer which performs operations and projects the information instead of light.

**10.Computer Networks and Network Topogy; LAN,WAN, etc.**

A Computer Network is a system of connected computers, peripherals and communication devices that can exchange data and share resources. If the network is limited to a single building or group of buildings then it is described as a Local Area Network (LAN). Computers in a LAN can be linked together directly but more commonly are linked through a hub or switch. The network connections can be cable, fiber-optic, or wireless (infra-red, microwave or radio). A router acts as an interface between networks, passing data packets back and forth between them.

Hardware such as printers can be shared by all the computers on the network. Some software and files such as databases can be shared by different users. Users can work together as networked computers can communicate with each other easily and quickly via email or internal messaging systems. An Internet connection can be shared. File storage facilities can be shared and files therefore accessed from any networked computer. Improved security as there is central control over user access, which programs, data and hardware users have access to. Files can easily be backed up centrally.

*A typical computer network interface card for a cabled network connection*. A network adapter such as a network interface card (NIC) is needed to connect computers and other peripherals to a network, either by cable or wirelessly. Each connected device is allocated an IP address to uniquely identify it on a TCP/IP network. Cabling is needed in a non-wireless network to connect the computers and peripherals together, either directly or through a hub/switch. The amount of cabling needed depends on the network topology (the way computers and peripherals are physically connected together).

A hub is used to link computers and peripherals together in a cabled network that uses a star network topology.

A switch is used in the same way as a hub but the switch uses the IP address of the data packet to direct the data to the correct device, rather than being sent out to all the connected ports.

A wireless access point is a device that allows computers and printers etc. to connect to a wired network using radio waves rather than cabling, provided they are equipped with a wireless NIC.

*Client-server network.* On a client-server network there are two types of computers with two distinct roles. One or more server computers which have the role of: controlling access to shared files; installing software on the client computers; allowing the client computers to access networked printers and managing print queues; controlling client computer access to the Internet; controlling user access to the network by verifying usernames and passwords’; controlling the levels of access to files and software once users have once logged onto the network; storing, delivering and sending email.

Multiple client computers (workstations) are then connected to the server computers. These are where the user actually works. Some servers may have a more specialized role such as a print server, dedicated to controlling access to shared printers on the network and queuing print jobs in the order that they were sent by the users.

*Peer-to-peer networks.* In a peer-to-peer network computers are simply linked together, either using cables and a hub or with a wireless connection. All the computers in the network have equal status so there is no server controlling the network. Provided that sharing has been enabled, any computer on the network can access data from of any other computer and any computer on the network can use a printer connected to any other computer. A peer-to-peer network will be cheaper to set up and, provided there are only a small number of computers, will be easier to manage than server-based networks.

There are three common network topologies: ring; line (bus) and star.

**Ring topology.** This is typically a peer-to-peer network. The devices are connected in a ring and data travels in one direction using a control signal called a ‘token’. To send data, a computer must wait for the token to reach it, attach the data to the token, and then return both to the network. When the token reaches the intended destination, the receiving device removes the data from the token and returns it to the network so the process can start again.

**Bus (line) topology.** This is typically a peer-to-peer network. Devices are connected to a main (bus) cable using special T-connectors. If data is being sent between devices, then the other devices cannot transmit. The bus cable must have a terminator fitted at each end to prevent reflected signals.

**Star topology.** This is typically a client-server network. A central computer (server) is connected to the other devices either through a switch or hub.

A WAN covers a much larger geographical area than a LAN. The largest WAN is the Internet itself as it is a global network of linked computers and LANS. Smaller examples of a WAN would include a national ATM network used by a bank to allow customers to access cash. Many supermarkets and other large companies operate their own national WANs.

*IP Addressing*. An Internet Protocol (IP) address is a unique address number that is allocated to devices on a computer network that uses the Internet Protocol.

Each address has to be unique as it is used to identify a particular device on a network, allowing data to be sent to the correct device and returned to the device that requested it. An IP address can be private, (for use on a LAN) or public (for use on the Internet or another WAN).

*MAC Addressing*. In computer networking, a Media Access Control address (MAC address) is a unique 48-bit number assigned by the manufacturer to any hardware device used to connect to a network. MAC addresses are limited to being used on a LAN. Because they are so long, MAC addresses are usually displayed as 8 hexadecimal numbers.

*Data Packets.* Modern computer networks, including the Internet, carry data by breaking it down into a series of distinct units called data packets, rather than sending it as a continuous stream of data. A typical data packet might contain 1,000 to 1,500 bytes.

In complex networks such as the Internet, a series of packets sent from one computer to another may follow different routes to reach the same destination and may arrive out of order. This technology is called packet switching and makes the network more efficient because the network can balance the load across various pieces of equipment and if there is a problem with one piece of equipment in the network then packets can be routed around it.

*Protocols.* A communications protocol is a description of the format that digital data has to be in and the rules for hardware/software to communicate that data.

Examples include the Internet Protocol Suite, the set of communications protocols used for the Internet and similar networks. It is commonly also known as TCP/IP, named from two of the most important protocols in it:

The Internet Protocol (IP) – used to route data packets between networks and over the Internet.

The Transmission Control Protocol (TCP) – used to exchange data directly between two networked computers.

Some other common Internet Protocols:

HTTP (HyperText transfer Protocol): used on the World Wide Web for transferring web pages and files contained in web pages such as images;

SMTP (Simple Mail Transport Protocol): used for email;

TLS/SSL (Transport Layer Security / Secure Sockets Layer): Encryption protocols used with secure communications over the Internet.

*Network security techniques.* A network needs security to prevent unauthorized access to the information stored on the network and unauthorized access to hardware managed by the network.

*Suitable passwords:* a password is used in combination with the username to prevent unauthorized access to a network. A suitable (strong) should ideally not be a dictionary word and should include a mixture of upper-case and lower-case letters, numbers and even symbols so it is unlikely to be guessed. Many network authentication systems will require users to regularly change their passwords and block the use of previous passwords. Stored passwords on the network should be encrypted.

*Access restrictions:* users can only log in during certain hours of the day and from certain computers. HTTP is a secure web connection.

*Encryption:* files can be encrypted making the data meaningless without the correct numerical key to decrypt it. This is particularly important with wireless networks and sensitive data such as online financial transactions.

*Firewall*: this can be a device or be software-based. Its purpose is to control network transmissions between networks. It is commonly used to block unauthorized access hacking to a network from the Internet, while allowing legitimate network traffic through.

*Antivirus software:* Many viruses are designed to bypass security systems and having up-to-date antivirus software installed will reduce this risk.

*Wi-Fi access restrictions* should be in place to allow only legitimate computers to connect to the network. All data transmitted over Wi-Fi should be encrypted using the highest level available.

*Filtering:* certain websites can be blocked by filtering. However, this only increases security if the sites are known security risks, for example they distribute viruses.

**11.Internet, WWW**

1. The Internet is a global network connecting millions of computers. The largest number of Internet users is in China, followed by the United States and India. In the early days, most people just used the Internet to search for information. Today the Internet helps many people communicate, work, learn, and have fun.

2. The Internet enables computers to send one another small packets of digital data. For that to work, they use a common ’language’ called TCP/IP (Transmission Control Protocol / Internet Protocol). If you are on the net, you have an IP address. This address is a way to identify a computer on the Internet. Packets of Internet data are transmitted through a variety of cables, routers and host computers on the way to their destination.

3. The Internet began in 1969. During the next two decades, the network that evolved was used mainly by universities, scientists and the government for research and communications. The nature of the Internet changed in 1992, when the U.S. government offered Internet access to the general public. The number of users grew rapidly into the millions and then hundreds of millions. The main reasons for this massive increase were the huge growth of the personal computer market, the invention of the World Wide Web by Tim Berners-Lee in the early 1990s, and the widespread adoption of broadband in the 2000s.

4. The Internet consists of multiple data systems. The most popular and important systems are:

**WWW, the World Wide Web, a collection of files or pages containing links to other documents on the Internet. Most Internet services are now integrated on the Web.**

Nowadays, the terms "Internet" and "World Wide Web" are often used interchangeably—but they're actually not the same thing. **The Internet is the physical network of computers all over the worl**d. **The World Wide Web is a virtual network of websites connected by hyperlinks**. Websites are stored on servers on the Internet, so the World Wide Web is a part of the Internet. A web browser is a kind of application you use to access the World Wide Web. Any Internet-connected device like a laptop, tablet or smartphone should come with a browser pre-installed. PCs come with Internet Explorer, and Macs come with Safari. **If you prefer to use a different browser**, you can download Firefox, Google Chrome, or Opera. **Web pages are written with a simple coding system, called HTML (Hypertext Markup Language**). **A browser takes the HTML and translates it into the content you see on the screen. W**ebsites often have links to other sites, also called **hyperlinks**. **A web browser lets you navigate from one link to another.** To get to a webpage, you can **type the URL** (Uniform Resource Locator) into the browser address bar. The URL, also known as the web address, tells the browser exactly where to find the page. **However, most of the time, people get to a webpage by following a link from a different page or by searching for the page using a search engine.** If you type keywords or a phrase into a search engine, it will display a list of websites relevant to your search terms. A set of transfer rules, called HTTP (Hyper Text Transfer Protocol) is used to link Web files together across the Internet. This is why web page addresses begin with http, followed by a colon and two slashes.

E-mail, or electronic mail, for the exchange of messages and attached files. Mailing Lists are a combination of e-mail and discussion groups. Subscribe to a list and messages are distributed to your e-mail box.

Instant messaging (IM), a system for sending public and private messages to other users in real time over the Internet. You can chat privately with a friend, family member or business colleague. The latest IM programs also incorporate telephone, video and file-sharing facilities and are becoming an alternative to traditional video conferencing programs. The most popular instant messaging services include Skype, WhatsApp, Viber, Telegram, etc.

File Transfer Protocol (FTP), a system for transferring data files between computers via the Internet. Video conferencing, a system that allows transmission of video and audio signals in real time, so users can exchange data, talk and see one another on the screen. Some services also let you do video conferencing, such as Skype and Facebook Video Calling. VoIP (Voice over Internet Protocol), or Internet Telephone, a system that lets people make voice calls over the Internet.

**12. Software: classes (programming, system, application) and types. Programming languages.**

**Computer software** is a term used to describe a collection of computer programs, procedures and documentation **that perform some tasks** on a computer system.

In computers, software **is loaded into RAM** **and executed in the CPU**. when the software is loaded, the computer is able to execute the software. Software is usually **written in high-level programming languages** that are easier and more efficient for humans to use than machine language. There are different classes of computer software which are useful for several purposes.

**System Software** coordinates work of all **system hardware**. It is the most basic type of software in any computer system. For desktop computers, laptops and tablets System software examples are Microsoft Windows 10, Mac OS, Linux, Ubuntu, devices drivers, etc. For smartphones: Apple’s iOS, Google’s Android, Windows Phone OS.

**Application Software** include programs that help the **user perform tasks of his/ her choice**. Application software examples are MS Office, OpenOffice, Media Players, educational software, media development software, antivirus software, etc.

There are some **examples of application software** that allow you to do specific work: **MS Excel**: It is spreadsheet software that you can use **for presenting and analyzing data. Skype:** It is an online communication app that you can use for video chat, voice calling and instant messaging.

***Programming software*** is used to write, test, debug, and develop other software programs and applications.

Programming software is used by software programmers to **translate programming languages** (i.e., Java, C++, Python, PHP, BASIC) into machine language code. Translators can be compilers and assemblers. You can understand compilers as programs that translate the whole source code into machine code and execute it.

There are five **additional subcategories of software**. These are: Freeware; Shareware; Open Source Software; Closed Source Software; Utility Software.

**Freeware software** is any software that **is available to use for free**. They can be downloaded and installed over the internet without any cost. Some well-known examples of freeware are: Google Chrome; Skype; Instagram; Snapchat; Adobe reader.

**Shareware**, on the other hand, are software applications that are paid programs, but are **made available for free for a limited period of time known as ‘trial period’**. You can use the software without any charges for the trial period but you will be asked to purchase it for use after the trial ends. Shareware allows you to test drive the software before you actually invest in purchasing it. Some examples of Shareware that you must be familiar with are: Adobe PhotoShop; Adobe Illustrator; Netflix App; Matlab; McAfee Antivirus.

**Open Source Software** is a type of software that has an open-source code that is available to use for all users. It can be modified and shared with anyone for any purpose.

**Closed Source Software**. These are the types of software that are non-free for the programmers. only the original authors can copy, modify and share the software. Following are some of the most common examples of closed-source software: .NET; Java; Android; Microsoft Office; Adobe PhotoShop.

**Utility software** is considered a subgroup of system software. They **manage the performance of your hardware** and application software installed on your computer. Some features of utility software include: Antivirus and security software;Disk cleaner;

**13.Operating Systems(definition, classification, types)**

An Operating System (OS) is a powerful program that **controls** the software and hardware on a computing device. In general sense, an OS is that software which **helps a user use other applications on his computing device**.

All the computers and computer-like devices **have Operating System**, including laptop, desktop, or any other smart computing system like a smart phone or a smart watch. Some of the popular OS are Linux, OS X, WINDOWS.

The OS **performs multiple functions and management**. It **manages** computer’s hardware resources **by performing services**: controls Input and Output devices such as a mouse, keyboard, display monitors, scanners and printers; **it manages network devices** such as routers, modems and network connections;

**Back end utilization** of software applications for managing hardware resources. It manages the allocation **of internal memory** between multiple applications. An OS sends message about the status of operation and any error that may have appeared to the interactive user.

**The functions** of an OS include:

*Memory Management*. One of the main functions of OS is to **manage the primary and secondary memory**. **Memory allocation** to the processes is also decided and checked by Operating System. It decides and checks **which process will have memory** and at what time.

Device Management. An OS manages device communication. It decides which **process** will get the device, when and for how long.

Processor Management. In a **multiprogramming environment**, it is OS which decides which process will get the processor when and for how long.

File Management. In a file system, generally **directories are organized for usage and easy navigation**. This collective is known as File System. It decides who will get the resources.

Security. An OS by using password and other similar techniques prevents and checks **unauthorized users to access the** data and program.

Error Detection. By using various **error detection methods** an operating system helps in prevention of errors.

**Types of Operating Systems**

The family of operating systems can be categorized into four types.

A **Real Time Operating System** (RTOS) needs **to provide** real time applications that process data without **buffer delays**. Examples of Real Time systems are **Air Traffic Control Systems**, Command Control Systems etc.

Real Time systems are classified **in three types depending on two factors** i.e. on factors **inside the computer system** and factors **outside the computer system**.

Command Control systems and *Air traffic control systems* are best examples of **Hard Real Time systems**. Online transaction systems, like booking a movie ticket or airline reservation systems are best examples of **Soft Real** Time systems. Multimedia applications is one example of Firm RTOS.

**Single User Single Task Operating Syste**m. As the name indicates, Single User Single Task OS is a system in which only **one program is executed at one time.** It manages the computer in a way that one user can successfully perform one thing at a time.

**Single User MultiTasking** Operating System. Most people use this Operating-System on their computers, laptop and desktops today. Best examples of these types of Operating System are A**pple’s Mac OS platform and Microsoft’s Windows**. This Operating System will allow a single user **to operate several programs at the same time**. For example, a Windows user may be writing an email while printing a word document while downloading a file from Internet.

Multi User Operating System allows various different users on different desktop or computer to access a single System.

The Operating System takes care of all the requirements of the various users in a balanced way.

An Operating System (OS) is a powerful program that manages and controls the software and hardware on a computing device so as to make the device behave in a predictable but flexible way. An OS acts an interface between a user and a device. Thus, in general sense, an OS is that software which helps a user to run other applications on his computing device.

All the computers and computer-like devices comprise Operating System, including laptop, desktop, or any other smart computing system like a smart phone or a smart watch. Some of the popular OS are Linux, OS X, WINDOWS, VMS, OS/400, AIX, z/OS, etc.

The OS performs multiple functions and management. It manages computer’s hardware resources by performing required services:

Front end management of hardware resources. It manages Input and Output devices such as a mouse, keyboard, display monitors, scanners and printers; it manages network devices such as routers, modems and network connections; it manages storage devices, both internal and external drives.

Back end utilization of software applications for managing hardware resources. It manages the allocation of internal memory between multiple applications. An OS sends message about the status of operation and any error that may have occurred to the interactive user. It helps in performing batch jobs for example, printing etc.

The functions of an OS include: Memory Management. Device Management. Processor Management. File Management. Controls System Performance. Security. Error Detection. Coordination among Software and Users. Job accounting.

*Memory Management.* One of the main functions of OS is to manage the primary and secondary memory. All the memory devices such as hard disk, pen drive etc. are managed by OS. Memory allocation to the processes is also decided and checked by Operating System. It decides and checks which process will obtain memory and at what time.

*Device Management.* An OS with help of their respective drivers manages device communication. Following activities are performed by an Operating System for device management: It keeps a track of all devices.

*Processor Management.* In a multi-programming environment, it is OS which decides which process will get the processor when and for how long. This task is called Process Scheduling. Following activities are done by OS for processor management: It keeps a track of processor tasking and checks the status of process. Traffic controller performs this task. It allocates the processor and also de-allocates processor when a process is complete and not required.

*File Management.* In a file system, generally directories are organized for usage and easy navigation. Following activities are performed by an OS under file management: It keeps a track of location, information, status etc. This collective is known as File System. It decides who will get the resources. It allocates and de-allocates the resources.

*Controls System Performance.* An OS records delays between a request and response of the system.

*Security.* An OS by using password and other similar techniques prevents and checks unauthorized users to access the data and program.

*Error Detection.* By using various error detecting aids an operating system helps in prevention of errors.

*Coordination among Software and Users.* It Coordinates and assigns compilers, assemblers, interpreters and other software to users.

*Job accounting.* It keeps a track of resources and jobs used by different users all the time.

**Types of Operating Systems**

The broad family of operating systems can be categorized in to four types based on their controlling and supporting systems. These types of Operating System are: *Real Time Operating System* (RTOS); *Single User Single Task* OS; *Single User Multi Tasking* OS; *Multi User* OS.

A *Real Time Operating System* (RTOS) intends to provide real time applications that process data without buffer delays. A Real Time Operating System is a time bound operating system which has fixed time constraints. Processing has to be done within the defined time constraints or the system will definitely fail.

*Single User Single Task* Operating System. As the name indicates, Single User Single Task OS is a system in which only one program is executed at one time. It manages the computer in a way that one user can successfully perform one thing at a time. There is a problem with these types of Operating System that the program has to be arranged in a queue.

*Single User Multi Tasking* Operating System. Most people use this Operating-System on their computers, laptop and desktops today. Best examples of these types of Operating System are Apple’s Mac OS platform and Microsoft’s Windows. This Operating System will allow a single user to operate several programs at the same time. For example, a Windows user may be writing an e-mail while printing a word document while downloading a file from Internet.

*Multi User* Operating System allows various different users on different desktop or computer to access a single System. A user at the terminal or desktop, through a network takes access of the system and other system attached machines such as printers.

The Operating System takes care of all the requirements of the various users in a balanced manner. Also, it ensures that each of the programs being used has a separate and sufficient resource so that problem of one user doesn’t affect the entire community of users.

**14.Computer Viruses and Computer Security**

A computer virus is **a malware program** that is written to have **access** to a computer without its owner’s permission. These kinds of programs are primarily **written to steal or destroy computer data**.

There are different types of computer viruses that can **be categorized according to their origin**, storage location, files they infect and destructive nature.

2. **Direct Action Virus**. This virus quickly gets into **the main memory**, infects **all programs/files/folder** and then **deletes itself**. In most cases, **they don’t delete system files** but change the system’s **overall performance**.: Use antivirus scanner. Direct action virus is **easy to detect** and all infected files can be **restored completely**.

4**. Web Scripting Virus**. A web scripting virus **destroys web browser security** and allows attackers to inject client-side scripting into the web page. It is used **to attack large sites** like social networking, user review or email. It can send **a large amount of spam and damage files on sever**. Protection: **use cookie security or install real-time protection software for the web browser**.

5. **Directory Virus.** Directory Virus infects the file by **changing the DOS** **directory information** When you **run a program**, DOS **first loads and executes the virus code before** running the actual program code. It becomes very difficult to locate the original file after getting infected. Example: Dir-2. Protection: Install the antivirus to relocate the misplaced files.

5. **Polymorphic Virus**. The polymorphic virus **encodes themselves** using different encryption keys and algorithms each time they **infect a program or create a copy of itself**. Because of different encryption keys, it becomes very difficult for the antivirus software to find them. **It can affect any file**. Protection: Install advanced, high-end antivirus software.

7**. Memory Resident Virus**. These viruses live **in primary memory (RAM)** and get activated whenever **you switch on the compute**r. They affect all files currently running on the desktop. It can affect any file running on PC and files that are being copied or renamed.

8. **Macro Virus**. This virus is written **in the macro language**, so it may run automatically when the **document is opened** and **it can easily spread to other files too**. It depends on the application rather than the operating system. It can affect: .mdb, .PPS, .Doc, .XLs files. Protection: Disable macros and **don’t open emails from unknown sources**. Alternatively, you can install modern antivirus software that can **detect macro virus easily**.

12. **Trojan Horse**. Trojan Horse (or Trojan) is a type of malware that looks legitimate. Users are typically **tricked into loading and executing it on the system**. It can destroy/modify all the files, crash the computer, modify the registry, and is strong enough to give hackers **remote access to your PC**.

13.**Computer worms**. Worm is a program that **replicates itself in order to spread to other co**mputers. It **relies on networks (mostly emails) a**nd security holes to travel from one system to another.

10. **Multipartite virus**. They usually **stay in memory and infect the hard disk**. Once it gets into the system, it infects all drives by changing all applications’ content. You will soon start noticing performance lag and low virtual memory available for user applications.