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MODULE 1

CONCEPTS OF INFORMATION AND COMMUNICATIONS TECHNOLOGIES

In this module, you will learn the following:

- *what is hardware;*
- *how to use units of measurement particular to computers;*
- *what are the main components of a computer and their characteristics;*
- *how to recognize the various computer ports;*
- *types of software;*
- *how to choose an internet connection;*
- *practical applications of information and communications technology in everyday life;*
- *how to ensure information security.*

Although a user of information and communications technologies does not need to thoroughly understand the operation and design of all hardware and devices, it is useful to know the basics: the names and purpose of hardware and systems.

For example, no help desk can give any advice if the user fails to correctly explain what exactly has gone wrong or is not functioning. Similarly, when signing a contract on communications services, the user should understand the differences between various offers, their benefits and disadvantages.

Units of Measurement

Computers are digital devices, and their functioning is based on mathematical operations with only two values: zero and one. The binary numeral system is the most suitable for this purpose, as it provides the most basic processing of electrical signals: 1 – signal, 0 – no signal. This mathematical system is the basis of the units of measurement used in information technologies:

- Bit – the smallest unit of information, either 0 or 1. Its unit symbol is **b** or **bit**.
- Byte – equal to eight bits; its unit symbol is **B**. In computer hardware, any operation or piece of information must be translated into machine-readable code. It is a historical aspect that there are eight bits in a byte. Eight bits can be used to describe, for example, any character on the keyboard, and other powers of 2 are also suitable for programming languages.

Storage Capacity

Storage capacity is measured in bytes and derived larger units of measurement. The units use binary prefixes, which slightly differ from decimal prefixes due to being based on powers of two:

- Kilo – **K**, multiplied by 1024, equals 2^{10} ;
- Mega – **M**, multiplied by 1,048,576, equals 2^{20} ;
- Giga – **G**, multiplied by 1,073,741,824, equals 2^{30} ;
- Tera – **T**, multiplied by 1,099,511,627,776, equals 2^{40} .

For example:

1 KB = 1024 B; KB – kilobyte

1 MB = 1024 KB; MB – megabyte

1 GB = 1024 MB; GB – gigabyte

1 TB = 1024 GB; TB – terabyte

Useful tip

Although the capacity of data storage devices is usually expressed with the typical decimal prefixes, most operating systems use binary prefixes (powers of two). Due to this, a device's storage capacity specified on the packaging and the actual capacity shown by the computer can differ.

Data Rate

Data rates, such as internet connection speed, are measured in bits (and derived larger units) per second: **bit/s**; **bps**. This unit expresses the amount of bits conveyed or processed per a unit of time (one second).

Unlike storage units, data rates traditionally use decimal prefixes:

Kilo – multiplied by 1000;

Mega – multiplied by 1,000,000;

Giga – multiplied by 1,000,000,000.

For example:

1 Kbit/s = 1000 bit/s

Data rates are also used for multimedia. In the specifications of audio and video signals, the rate indicates the amount of data saved per a unit of time. More data means higher quality, but also more storage space required.

For example, MP3 audio with a bitrate of 192 Kbit/s will sound much better than the same audio with a bitrate of 32 Kbit/s.

In computer networks, bitrate is to describe the connection capacity or network bandwidth.

For instance, a typical computer network can provide a data rate of 100 Mbit/s or even 1 Gbit/s, depending on the devices and computers used on the network; a digital telephone line can provide a data rate of 256 Kbit/s to 40 Mbit/s, depending on communications cables used and service provider capacities.

Processor Clock Rate

The clock rate of a processor and other electronic circuitry is measured in hertz – Hz. This unit indicates the number of operations per a unit of measurement (one second). Typically, larger units of measurement are used, expressed with decimal prefixes:

1 MHz = 1,000,000 Hz; MHz – megahertz

1GHz = 1000 MHz – gigahertz

Hardware

In order to use information and communications technologies (ICT), **hardware** is required. The term “hardware” is used to refer to physical devices and their components.

Personal Computer (PC)



In 1981, IBM developed a computer system for personal, unassisted and independent use. Other companies followed suit and also began manufacturing such computers, which led to introduction of the term **PC-compatible computer** in the 1980s. These computers are characterised by:

- Capacity: the size of the computer's permanent and random-access memory (**RAM**);
- Components: PCs use standardized components;
- Performance: the computer's speed and suitability for the tasks to be performed;
- Cost: relatively low purchase price and maintenance expenses;
- Usage: intended for personal use in all areas.

Laptop



A **laptop** is a compact computer that integrates the hardware components and display in a single unit and has a rechargeable battery. Unlike personal computers, laptops use components that are small-sized or designed for a specific model, which makes them costlier and makes it more difficult to upgrade the computer's performance later in its life.

Notebook

A **notebook** is smaller than a laptop, but larger than a personal digital assistant.

Netbook

A **netbook** is a small portable computer designed for network use and internet services. Netbooks typically have integrated hardware allowing the use of various data transfer technologies.

Personal Digital Assistant (PDA)

A **personal digital assistant** is a small computer with an autonomous power supply; it is used for work organization and scheduling, note-taking, viewing and editing documents while outside the office, as well as for mobile internet access and data transfer using various technologies. PDAs often have a touchscreen instead of a dedicated keyboard. Many models are adapted for barcode reading and determination of location with the help of the Global Positioning System (GPS).



Mobile Phones

A **mobile phone** uses coverage provided by special telecommunications towers. Although the primary function of mobile phones is mobile communication, today they provide various extra features, such as a camera, GPS navigator and additional software. Connecting to the internet allows browsing the web and using e-mail. Many mobile phone models function as PDAs, as well. Smartphones offer features similar to those of computers.

Media Players

A **media player** is a portable device for audio and video file storage and playback. A popular example is the Apple iPod.

Hardware Components

Understanding the main **hardware components** is necessary to choose the right computer system and software for the task at hand. The components described below may be placed in a separate case (also known as the system unit) or integrated into other components of a PC-compatible computer.

Processor

The **processor** (CPU; Central Processing Unit) is one of the most important hardware components – its clock rate determines the overall performance of the system. The processor carries out the instructions of programmes. A processor is designed as a complex microchip, and a single unit can contain several processors.



The main characteristics of a processor are as follows:

- **Type** – the type of the processor, the maker's brand. The largest makers of PC processors are **Intel** and **AMD**;
- **Speed** – the processor's clock rate, usually measured in gigahertz (GHz);
- **Bus type** – transfer of signals between the processor and the other components of the computer. Buses are characterised by the number of bits transferred simultaneously. Today, computer systems use 32- and 64-bit buses. This characteristic also describes the computer as a whole. The maker specifies the data transfer rate of the bus – the bus speed.

Useful tip

The performance of various processor types can differ in spite of having the same clock rate.

Random-Access Memory

Random-access memory (RAM) is used to store data while the computer is on, ensuring the operation of the operating system and programmes. Data is stored, accessed and removed as needed. For example, while creating a document, it is first stored in random - access memory and only later saved in permanent storage. The contents of random-access memory are removed when the computer is shut down. The larger the computer's random-access memory, the better.

Modern operating systems require at least 1 GB of RAM.

Non-volatile Memory

Non-volatile memory (also called permanent memory) ensures the storage of software and user-created data. Computer systems usually have an integrated hard drive (**HDD; hard disk drive**). The hard drive is a hermetically-sealed mechanical device with spinning platters made of magnetic materials. Its main characteristics are:

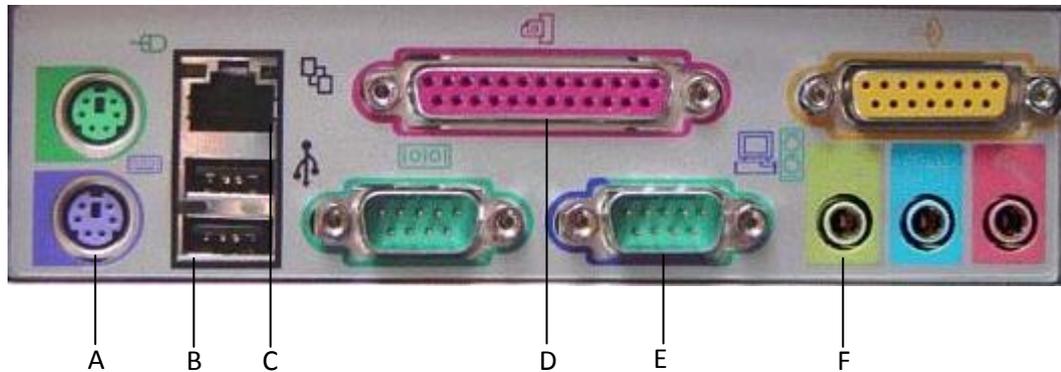
- **Storage capacity** – tens and hundreds of GB. Hard drives with a storage capacity of several TB are available today.
- **Speed** – the speed of the hard drive's platters; revolutions per minute.
- **Bus interface** – connection types such as **SATA** and **PATA (IDE)**.
- **Size** – PCs use hard drives with a 3.5-inch form factor; portable computers use 2.5-inch drives.

Ports

The system unit alone is typically not enough; it is also necessary to have information input and output devices, and external storage devices, which are connected via special ports.

USB

Universal Serial Bus (USB) is the current standard for connection of external devices. There are usually several USB ports. USB allows connecting and disconnecting devices without shutting down the computer. It is used to connect printers, scanners, camcorders, digital cameras, and USB flash drives.



A – PS/2; B – USB; C – RJ 45; D – LPT; E – COM; F – audio-out port

Image 1. Computer ports

PS/2

PS/2 ports are used to connect the mouse and keyboard, and are colour-coded:

- Purple – keyboard;
- Green – mouse.

Serial Port

The serial port (**COM Port**) is located at the back of the computer. It is characterised by a slower data transfer rate compared to USB.

Parallel Port

The parallel port (**LPT Port**) is located at the back of the computer, and is typically used to connect legacy printers.

Nowadays, both serial and parallel ports have been replaced by connections of the USB standard.

Note!

A device may be connected via the **COM** or **LPT** port only when the computer is off.

Computer Network Port

Network ports (**LAN, RJ 45**) are used for computer network connections to other computers and internet.

FireWire

FireWire is the name used by Apple for a high-speed **IEEE 1394** standard port. The port is used by camcorders to transfer of large amounts of data. FireWire is available on computers designed for multimedia use.



Bluetooth

Bluetooth is a wireless standard for exchanging data over short distances. It allows for cable-free connection of other devices to a computer.

Input Devices

Input devices are used on computers to enter information and input commands. They are connected to the computer via ports or wirelessly.

Typical input devices:

- Keyboard – used to enter alphanumeric characters and symbols.
- Mouse – a representation of the user's hand in the environment of the operating system.
- Touchpad – a tactile input device used mostly in portable computers; replaces a mouse. A touchpad can also be a specialized larger-sized device used for graphical work.
- Scanner – used for transformation of graphical information into a file format readable by the computer.
- Joystick. – used mostly used in computer games; equipped with additional buttons.
- Webcam – a video camera with reduced picture quality, designed for use on the internet.
- Microphone – used to input audio signals to the computer.

Output Devices

Output devices are used for information output:

- Monitor – characterized by the diagonal screen size in inches. **LCD** (liquid crystal display) monitors are the most widely used today. Touch-sensitive monitors are available as well.
- Projector – used to project an image on a screen in larger size; suitable for meetings. Project presentations are a typical example.
- Printer – used to print out documents. The main types are inkjet and laser printers. Different printers are suited to different print volumes.
- Speakers, headphones – for audio output.

- Plotter – intended for wide-format printing, also used in cartography.
- Automated machine tools – controlled with the help of special software.

Note!

Many devices are multifunctional and act as both input and output devices at the same time; some examples are interactive whiteboards, multifunctional printing devices, and touchscreens.

Task 1.1. Which of these is an input device? Choose one answer:

- A – CD drive
- B – Mouse
- C – Printer
- D – Speaker

External Storage Devices

External storage devices are used for permanent storage and moving of information.

External Hard Drives



Hard disk drive in an external enclosure that has an autonomous power source or receives power through a USB port; it suitable for data storage, moving large amounts of information, as well as creation of backup copies. It is usually connected to the computer with a USB cable.

Compact Discs

A **compact disc (CD)** is universal optical data storage medium.

- CD – a fabricated blank disc or a disc already containing information.
- CD-R – a disc on which information can be recorded once.
- CD-RW – a rewritable compact disc. New data can be recorded several times by deleting the previous files.

The storage capacity of a compact disk is approximately 650 MB.

DVD

A **DVD**, or **Digital Versatile Disk**, is an optical data medium similar to a compact disc, but with a larger storage capacity and higher read speeds.

The storage capacity is 4.7 GB for a single-sided DVD and 9.4 GB for a double-sided DVD.

Blu-ray

A **Blu-ray Disc (BD)** is an optical data medium with a diameter of 12 cm (the same as CD and DVD), but with a larger storage capacity. The storage capacity of a single-layer BD is 25 GB, double-layer – 50 GB. Blu-ray is a relatively new technology.

Note!

To use a CD, DVD, or Blu-ray Disc, the computer must have a suitable disc drive. For example, if the computer has a CD-R drive, it will be able to read CDs, as well as read and write CD-Rs, but will not be able to rewrite CD-RWs or read DVD or Blu-ray Discs.

USB Flash Memory

USB flash memory is suitable for storage and moving of relatively small amounts of data. It is available in various designs and with different storage capacities.

Memory Cards

Memory Cards are typically used for storage of photos taken with digital cameras. Special small-format is used for smartphones and media players. They are characterised by:

- Type – there are many makers of memory cards, and many card types, such as SD, MMC, xD, etc.
- Storage capacity.



Many computers, including portable computers, are equipped with universal card readers for different types of cards.

Floppy Disks

Nowadays, **floppy disks** are rarely used due to their low storage capacity (1.44 MB), low mechanical durability, and susceptibility to environmental impacts.

Network Storage and Internet

Network storage is not connected to the computer as a separate physical device; it is connected via a network. This allows for centralized storage of important data and creation of backup copies. Network storage is typically an allocated storage space on a different computer.

Data can also be stored by using internet services. This allows accessing the data from different user locations.

Software

Software is a set of instructions which are understood by the computer and result in the computer performing specific operations. Software usually comprises individual programmes that can be visually understood by the user.

Operating System

An operating system is a type of software typically launched upon turning on the computer, and providing a graphical user interface. The operating system allows controlling the computer's hardware and connected devices. Popular operating systems include:

- Linux (various versions);
- Windows (various versions);
- Mac OS – an operating system for Apple computers;
- Android – an operating system for smartphones.

Applications

Applications are designed for execution of specific tasks on computer. Applications are developed for a specific operating system and are used as a universal platform for controlling components of the computer.

Types of Applications

It is useful to know the main groups of application software and understand the differences between them:

- Word processors – used for creation of text documents of various sizes, such as letters, applications, reports, books, and newsletters.

- Spreadsheets – used for calculations in tables, creation of large tables; e.g., for balance sheets, invoices, waybills, reports and budget calculations, as well as statistical analysis and accounting.
- Presentation programmes – used for demonstrating presentations on various events, projects and photo albums to an audience or for publishing them on the internet.
- Database management systems – used for systematic storage and processing of information, creation of registries.
- Graphics editing programmes – software for picture manipulation and creation, photo editing and retouching.
- Web browsers – for browsing websites.
- E-mail clients – for using electronic mail.
- Games and simulators – programmes for entertainment, training, situational modelling.

Task 1.2. Which type of application is best for creation of budget forecasts? Choose one answer:

A – Presentations;

B – Word processors;

C – Databases;

D – Spreadsheets.

Ease of Access

Virtually all operating systems provide options for users with accessibility needs:

- Screen magnifier;
- Screen reader – text-to-speech translation;
- Speech recognition – software control through simple voice commands;
- On-screen keyboard.

Computer Networks

Connecting a personal computer to a network enhances its functionality. Computer networks comprise an infrastructure of cables or communications channels and network switches.

Types of Computer Networks

Computer networks can be divided into the following groups:

- Local Area Network (LAN), a network that connects nearby computers; e.g., a home or office network. Computers on the network can share resources, as well as devices connected to the network. If the local area network has an

Internet connection, the Internet can be accessed by all connected computers. A local area network can also be established wirelessly.

- Wide Area Network (WAN), a computer network that connects together remote computers through dedicated communications channels or the Internet.
- Client-server network, a computer network model where data resources and software are located on special high-performance computers called servers. Service requesters, referred to as clients, connect to the server through the network and use these resources.
- The Internet, a global system of interconnected networks. Accessing the Internet allows using Internet services, conveying data regardless of distance and national borders, publishing materials online, and obtaining information published by others. The Internet consists of a vast amount of communications lines, channels, switches, computers, and other hardware.
- The World Wide Web (WWW), an Internet service. Typically used for browsing websites on the Internet with a web browser.
- Intranet, typically a computer network used by a single organization, in which resources are shared by using Internet technologies.
- Extranet, an intranet with limited access from the outside. Access is usually granted to trusted and authorized users.

Data Transfer over Computer Networks

Data transfer concepts:

- Downloading; receiving of data by the client; e.g., downloading a file from the Internet to the computer's hard drive.
- Uploading; sending of data from the computer; e.g., uploading a video to a specialized server on the Internet.

Types of Internet Connections

The data transfer rate varies depending on the network technology used and the type of connection to the particular computer or the Internet. Technologies develop quickly, and the available offers change along with them. Internet service providers usually offer a range of connection types at different prices.

An approximate comparison of the data transfer rates of various Internet connections:

- Dial-up connection through a telephone line. The maximum data transfer rate is 56 Kbit/s. The computer is connected to a telephone line with a special device called a modem. This connection type is slow.
- Mobile Internet. Access to the Internet is provided by a mobile communications network; a USB modem is required. The maximum data transfer rate is 7 Mbit/s (depending on the type of connection). The data rate can vary depending on the capacity of the mobile network. The connection can be subject to bandwidth caps and rate limiting.
- Cable connection; uses cable television infrastructure for Internet access. Transfer rate up to 30 Mbit/s; requires a modem.

- DSL, ADSL (**Digital Subscriber Line**); uses the existing public telephone network. Transfer rate up to 30 Mbit/s; requires a DSL modem.
- Fibre-optic connection; uses optical fibres instead of metal wires, and transmits pulses of light rather than electrical signals. Provides users with Internet connection at rates up to 500 Mbit/s; the technology allows for an even higher rate. Requires a modem.
- Wireless computer networks transmit and receive radio frequencies. The transfer rate can reach 150 Mbit/s between the computers connected on the shared network, depending on the network and computer hardware. The total available Internet bandwidth depends on Internet connection of the respective network.
- Internet connection through a local area network. Although a local area network ensures a high data transfer rate among the computers interconnected on the network (up to 1 Gbit/s), the Internet bandwidth depends on the Internet connection of the respective LAN.

Task 1.3. How are computers connected on a wide area network? Choose one answer:

A – With special cables

B – Through telephone lines

C – Via the Internet

D – Through intranet

Practical Applications of ICT in Everyday Life

A computer can perform many tasks better and faster than a person; computer systems permeate our lives more and more, offering conveniences that would be difficult to give up.

e-Services

e-Services can be received online, without leaving home.

Examples:

- Online banking; allows conducting and reviewing transactions from any computer connected to the Internet.
- e-Commerce. The most common example of e-commerce is buying and selling on the Internet, the advantages of which are wide accessibility and no limits on geographical locations, in contrast to traditional commerce. One can buy (or sell) products in England while residing in Lithuania.
- e-Governance. Online services of government agencies, such as online submission of income forms and reports, receipt of information.

- e-Services. The range of services available online is constantly growing, and includes online purchase of plane tickets, insurance, declaration of place of residence, vehicle registration, etc.

Online Learning

Teachers and students do not necessarily have to be together in time and place. There is a wide range of e-Learning courses available.

Advantages:

- Flexible scheduling of lectures;
- The student and the teacher are not tied to a specific location;
- Study materials based on Internet technologies boast multimedia qualities;
- Lower costs;
- Possibility to switch over to full-time studies;
- Suitable for persons with movement disorders.

Disadvantage:

- The student has no personal contact with the teacher.

Telework

Telecommuting or **telework** substitutes physical commuting to a workplace with working from home or other location; information and documents are sent with the aid of electronic communications and Internet technologies. In spite of the many advantages, this method has one significant drawback – the lack of personal contact with co-workers.

Communication

Electronic Mail

Electronic mail is a method of exchanging messages via computer networks and the Internet; the addressee receives the message virtually instantly. Using e-mail requires creating mailbox with an e-mail service provider. The mailbox is protected with a username and password.

Advantages:

- An e-mail message can be sent to many recipients at once;
- A message can have one or several file attachments;
- Users can access their e-mail account from any computer connected to the Internet;
- No paper needed;
- Very low direct and indirect costs;
- Messages can be received on mobile devices.

Disadvantages:

- The advantages of e-mail are also used by spammers and computer viruses;
- Attached files can contain viruses.

Instant Messaging

Instant messaging differs from e-mail in that it entails real-time online communication among two or more users. Dedicated applications or messaging features in a programme are typically used for this purpose. It is also possible to send attachments as files.

VoIP (Voice over Internet Protocol)

The **VoIP** technology has been developed for voice telephony services in computer networks and on the Internet. Although there were initially problems with the communication quality, the situation has improved along with improvement of the stability and speed of Internet connections and developments in software.

Today, this technology can be used not only by computers, but also special telephones. There are service providers offering to replace regular telephones and phone lines with VoIP technology.

RSS

Really Simple Syndication (RSS) is used to deliver the content of a website in the form of a brief description with clickable links to the full content. RSS content on a website is indicated by a special browser icon or graphical image on the site.



Blog

A **blog** or **web log** is an Internet site where a user or organization posts information on a particular topic (or topics). Information can also be posted by visitors of the website in a form established by the blog's owner. There are many hosts offering this service for free or for a small fee. Access to editing and creation of the blog's content is protected with a username and password.

Podcast

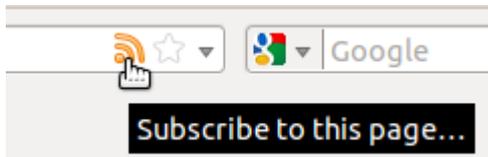
Podcasting means downloading specially prepared audio files published on the Internet and listening to them on a portable media player. Podcasts usually comprise a series of audio files (shows).

The audio files are prepared as follows:

- The show's host creates an audio file (or files) in MP3 format, and uploads it to a server on the Internet;
- An RSS file is created and posted on the Internet. The file contains basic information about the audio file – the title, description, and a link to its location on the Internet;
- The users checks the RSS feed by updating it. User checks and updates the RSS information;
- The user listens to the file on the client's application, or downloads the file.

Task 1.4. View an example of RSS on www.openoffice.org

1. Open the browser;
2. Enter the website address www.openoffice.org. Open the site;
3. Find the RSS icon in the browser address bar:



4. Click it. View the RSS feed page.

Virtual Communities

A **virtual community** is a public (social) online network created by using the Internet environment and technologies. Registration on the respective site is usually required to use these services.

Examples:

- Internet forums for sharing opinions and discussing various topics;
- Online chat rooms;
- Online multiplayer games;
- Social networking services with many features, such as providing users with the possibility to post information about them, upload videos and publish photos.

Note!

Personal information posted on the Internet may be accessed by other users of the respective services and indexed by Internet search engines!

Health

When spending long hours at a computer, it is important to ensure adequate work organisation and workplace ergonomics.

Some considerations of workplace organisation:

- The table must be suitable for adequate placement of the computer system devices;
- Choose lighting that does not create glare in the display;

- The recommended eye level is approximately 8 cm above the upper edge of the display;
- The recommended distance from the monitor is approximately 70 cm;
- The user's elbows should form a right or obtuse angle.

During work, it is necessary to take regular breaks of about half an hour.

Environment

Materials harmful to the environment – such as plastics and metal alloys – are used for the manufacturing of computer hardware and devices. In addition, the computer systems operation consumes power. Old computer hardware and replaced components must be recycled; they must not be simply thrown out.

Data Security

Computers are used more and more in our everyday lives; the amount of information stored is increasing with every day, as well. It is important to allow only authorized access not just to information in databases, but also to the individual user's computer system.

User Identification

Authentication

Authentication means checking user's identity in the computer system or online. A username (identifier) in conjunction with a password known only to the user is the most common method. It is also possible to use a smart card or a fingerprint reader. The electronic signature is another means of ascertaining the user's identity for online services. A successful authentication is followed by authorization – granting of user rights within the system.

Passwords

Passwords must be chosen carefully. The following aspects should be taken into account:

- A secure password contains at least eight characters, uppercase and lowercase letters, numbers, and symbols;
- The password is not displayed on the screen while being entered, so that others cannot see it;
- Words, numbers or abbreviations of personal significance or pet names should not be used as passwords;
- A password must not be written on a slip of paper and left in an easily accessible location. It is best to memorise the password;
- A password must not be disclosed to others;

- When working online, it is recommended to avoid saving the password in the browser;
- The password should be changed on a regular basis, if possible;
- Avoid using the same password for different sites or systems.

Task 1.5. Which is the best way of saving the PIN of a smart card? Choose one answer:

A – Writing it down on a slip of paper and keeping it together with the smart card

B – Memorising it

C – Saving it in a file on the computer

D – Writing it down on a slip of paper and storing it in a safe at the workplace

Backups

Imagine using your computer's hard drive to store many years' worth of family photos, work materials, documents, and collection of e-books – and all of this can suddenly be lost because of a hard drive failure. Due to this, it is important to back up your data on a different data storage device – a backup drive, external hard drive, optical data storage media, or on a different computer. This can be done by simply copying the information, or by using the operating system's automatic backup settings. Companies and organisations typically create regular backups on dedicated servers with a frequency depending on the importance of the data. An additional hard drive (or drives) can also be installed on a personal computer.

Firewall

As most computers today are connected to some type of computer network with an Internet connection, information is subject to a risk of unauthorised outside access. A firewall is one of the means of protecting the information; it can be either a physical device or software. The purpose of a firewall is to permit the computer to transmit signals and receive responses, while blocking unknown signals from the Internet (computer network). Many operating systems feature integrated firewall software.

Data Security Considerations

Physical access to a computer or server may lead to data leaks and illegal use of the information obtained. In this case, a username and a password will not ensure protection of the data, as they can be accessed with the aid of a different operating system or special software. There are countless examples of lost (stolen) portable computers containing confidential information.

Some advice:

- Ensure only authorised physical access to servers and workstations;

- Encrypt the hard drives of portable computers and USB flash drives by using the features of the operating system or special software;
- Ensure physical protection of laptop bags with special locks;
- Control the circulation of important information in the registration system;
- Destroy old storage media that are being replaced;
- For the protection of portable computers, use a special safety lock with a reinforced cable that cannot be cut with pliers;
- Keep personal digital assistants in a safe location;
- When leaving a computer, lock the screen to ensure that a username and password is required to turn it back on.

Computer Viruses

A computer virus is a programme performing undesired and unauthorised operations in a computer and with the files on the system. Different viruses perform different actions.

The possible outcomes of a virus infection:

- Slowdown of the computer system;
- Damage or encryption of files;
- Pollution of random-access and non-volatile memory;
- Further spreading of the virus on the computer network and in the form of e-mail messages;
- Theft of information and transfer to the virus developer;
- Blocking of the computer desktop and demanding a fee for unblocking.

Viruses can enter a computer in the following ways:

- Upon downloading infected illegal programmes and files;
- Upon using portable data storage media that have been connected to an infected computer;
- By spreading through a network, if there is an infected computer on the network;
- Upon visiting potentially harmful websites on the Internet.

Protection against Viruses

In order to protect a computer and information against viruses, the following aspects must be considered:

- An antivirus programme is necessary;
- The antivirus software must regularly update its virus database; most antivirus programmes do this automatically;
- Avoid opening unknown e-mail messages with attachments;
- Download files from trusted and reliable websites;
- Software must be updated on a regular basis; software developers regularly improve their products and fix bugs. Free updates are provided for legal software;

- The entire computer file system must be scanned on a regular basis by the antivirus programme or peripheral programmes.

Legal Issues

Although various types of materials are freely available on the Internet – such as software, pictures and texts – their distribution and use is limited by law. The author or owner of a resource also frequently specifies terms of use that must be observed.

Copyright

Copyright is a legal status defined by the Geneva Universal Copyright Convention in 1952, setting the rights on publishing, reproducing and distributing pieces of literature, musical pieces of work, works of art, etc.

Deliberate or unintentional copying, distribution or use of software, databases and other materials without the copyright holder's permission is called piracy.

A range of different protection methods, such as serial numbers, online activation, registration, etc., are used for protection of software against piracy. There are programmes that require a special dongle to be connected to a computer port to be used legally. The storage media of legal software often feature holographic images that are difficult to counterfeit.

The software registration data can usually be seen in the programme menu Help.

Licence

Regulations by a software developer or rights holder are specified in the licence regarding the software use. Upon software purchase, the end user accepts these agreements. The licence of the end user is deemed to be an agreement between the software developer (owner) and the user.

Software Types

Agreements on the software usage are specified by the developers.

- Shareware. Shareware can be freely downloaded, installed and used for a definite period of time. Thus, the end user can be aware that the product is suitable. The usage rights for this software must be obtained after the test period to use the respective product.
- Trial or a demo version. This is software of limited functionality or limited availability. A full version or a product key must be bought.
- Freeware. Freeware is subject to licence agreements specifying the software use. It is permitted to use the software and sell services connected with its implementation, but it is not legal to sell the software itself; it may also be specified that the software is available for free only for personal use.

- Open source software (GPL). Software whose source code is made available to the public. This allows the Internet community be involved in the programme development through shared and updates, as well as by providing translations in different languages.

Data Protection

The national law protects the personal data in online data bases; law in the European countries provides that a user is obliged to register a data storage system by ensuring the data protection against an unauthorised access. Acquiring information from a person, the user needing this data is obliged to provide information on himself and the reason for data requisition. Each person should be entitled to receive stored data.

In this module, you got to know the following issues:

- Concept of the computer system and hardware;
- Port use;
- Types of software and their use;
- How to tell that software is legally available;
- Differentiate between the types of computer networks;
- Examples on the daily use of Information and Communication Technology;
- How to handle information security items.

Supplement No. 1

Test your knowledge by completing the following task.

Explanation:

The task consists of 30 questions, each scored with a single point.

The task must be completed within 45 minutes.

Try to answer the questions on your own, without any help materials.

The test is passed if the score achieved exceeds 23 points (75% of the maximum possible 30 points).

1. Which of these is considered software?
 - A. Web browser;
 - B. Printer;
 - C. Monitor;
 - D. Computer manual on a compact disk.
2. What would you recommend an employee to take along when visiting a different office?
 - A. Scanner;
 - B. Printer;
 - C. Desktop computer;
 - D. Notebook computer.
3. What does the term *CPU* mean?
 - A. Central peripheral utility;
 - B. Central processing unit;
 - C. Webcam connector;
 - D. Database management system.
4. Which of these devices do portable computers typically have?
 - A. Barcode reader;
 - B. Mouse;
 - C. Touchpad;
 - D. Handle.
5. What will allow a computer to run faster?
 - A. Running several programmes at once;
 - B. Increasing the size of the random-access memory;
 - C. Connecting a more powerful printer;
 - D. Replacing the standard keyboard with an ergonomic keyboard.
6. Which of these statements is correct?
 - A. The contents of ROM are preserved even after the computer is shut down;
 - B. Programmes store their data in ROM;
 - C. Website store their temporary data in ROM;
 - D. The contents of ROM are removed when the computer is shut down.
7. Which of these best describes file downloading?
 - A. Copying a picture from a free online image gallery;
 - B. Data transfer from a server to a computer;
 - C. Saving an attachment in an e-mail programme;

- D. Data transfer from a programme to a server.
8. What does *instant messaging* mean?
- A. Sending text messages using a mobile phone;
 - B. Exchanging messages in real-time;
 - C. E-mailing several recipients at the same time;
 - D. Blogging.
9. What is a *kilobyte*?
- A. 100,000 bytes;
 - B. 1000 bytes;
 - C. 1024 bytes;
 - D. The storage capacity of a hard disk drive.
10. What can help people with vision impairment use a computer?
- A. On-screen keyboard;
 - B. Screensaver;
 - C. Auxiliary keys on the keyboard;
 - D. Screen magnifying software.
11. Which of these is both an input and output device?
- A. Scanner;
 - B. Touchscreen;
 - C. Barcode reader;
 - D. Webcam.
12. What is Linux?
- A. Spreadsheet;
 - B. Operating system;
 - C. Backup software;
 - D. Web server.
13. Which one is a data storage device?
- A. Processor;
 - B. RAM;
 - C. USB flash drive;
 - D. CD-RW device.
14. Which of these municipal services is the most-suited for being made available online?
- A. Marriage registration;
 - B. Declaration of place of residence;
 - C. Issuing of a note on taxes paid;
 - D. Granting of a construction permit.
15. What software manages the use of the computer system's resources?
- A. RAM;
 - B. Operating system;
 - C. Web browser;
 - D. Antivirus software.
16. For which of these tasks is a spreadsheet best suited?
- A. Writing applications;
 - B. Registration of patients at a healthcare facility;
 - C. Planning and recording of a family's monthly expenditures;
 - D. Creating presentations.

17. What is a typical file size of a text document on two pages?
 - A. 45 bits;
 - B. 45 bytes;
 - C. 35 kilobytes;
 - D. 670 kilobytes.
18. What is the term for the study process with the aid of internet technologies?
 - A. E-school;
 - B. E-studies;
 - C. E-learning;
 - D. E-training.
19. Which of these terms best describes a multimedia material published on a website for download and subsequent playback?
 - A. RSS feed;
 - B. Web blog;
 - C. Podcast;
 - D. YouTube.
20. Which of these online services usually allow uploading pictures and videos?
 - A. Chat rooms;
 - B. Online forums;
 - C. Social networks;
 - D. Online games.
21. Which of these can be safely published on a social network page?
 - A. Home address;
 - B. Phone number;
 - C. Hobbies;
 - D. Neighbour's work address.
22. Which of these best describes a computer network where one computer provides resources for others?
 - A. LAN;
 - B. Server-user;
 - C. Client-server;
 - D. Server-programme.
23. What is used for communications between branches of one company in Spain and Australia?
 - A. The internet;
 - B. Wireless network;
 - C. Wide area network;
 - D. The World Wide Web.
24. Which of these statements is incorrect?
 - A. Dial-up connections are stable and provide a high data transfer rate;
 - B. More than one computer can be connected to a broadband connection;
 - C. A dial-up connection makes the phone line busy;
 - D. Wireless communications are affected by the construction of the building.
25. Which one these statements best describes the concept of *intranet*?
 - A. Local computer network with an internet connection;
 - B. Organization's computer network that uses internet technologies;
 - C. Organization's computer network with no more than 10 computers;

- D. Home network.
26. What can cause repetitive strain injuries (RSI)?
- A. Inadequate posture while working with a computer for long hours;
 - B. Inadequate lighting that causes monitor glare;
 - C. Working at a computer with no footrest;
 - D. Tiredness.
27. Which of these is an example of e-commerce?
- A. Purchasing a plane ticket on the airline's website;
 - B. Researching the price of products online;
 - C. Acquiring information to distribute a product;
 - D. Disclosing your online banking account number and password to an online store.
28. How do copyrights apply to an article downloaded from a website?
- A. Copyrights apply for only one month;
 - B. Copyrights apply indefinitely;
 - C. Copyrights do not apply to downloaded materials;
 - D. The copyrights are automatically transferred to the downloader.
29. What is the best way of safeguarding against accidental data loss?
- A. Creating backup copies on a regular basis on removable data storage media;
 - B. Changing a password on a regular basis;
 - C. Copying all the files for once;
 - D. Defining restrictions for an access to a computer.
30. Which of these passwords would be best for use on social networks?
- A. Mycat;
 - B. P@\$w0rd;
 - C. 123456;
 - D. 120176.

Supplement No. 2

The ECDL requirements for Module 1: Basic Concepts of Information and Communications Technologies:

- To understand what hardware is, know about factors that affect computer performance and know about peripheral devices;
- Understand what software is; give examples of common applications software and operating system software;
- Understand how information networks are used within computing, and be aware of the different options to connect to the Internet;
- Understand what Information and Communication Technology is and give examples of its practical applications in everyday life;
- Understand health and safety and environmental issues in relation to using computers;
- Recognize important security issues associated with using computers;
- Recognize important legal issues in relation to copyright and data protection associated with using computers.

Category	Knowledge Area	Ref.	Knowledge Item	Page
1.1 Hardware	1.1.1 Concepts	1.1.1.1	Understand the term „Hardware“.	
		1.1.1.2	Understand what a personal computer is. Distinguish between a desktop, a laptop (notebook) and a tablet PC in terms of typical users.	
		1.1.1.3	Identify common handheld portable digital devices, like a personal data assistant (PDA), a mobile phone, a smartphone, a multimedia player and know their main features.	
		1.1.1.4	Know the main parts of a computer, like a central processing unit (CPU), types of memory, hard disk, common input and output devices.	
		1.1.1.5	Identify common input/output ports, like USB, serial, parallel, network port and the FireWire.	
	1.1.2 Computer Performance	1.1.2.1	Know some of the factors that impact on a computer's performance, like CPU speed, RAM size, graphics card processor and memory and the number of applications running.	
		1.1.2.2	Know that the speed (operating frequency) of the CPU is measured in megahertz (MHz) or gigahertz (GHz).	
	1.1.3 Memory and Storage	1.1.3.1	Know what computer memory is: RAM (random-access-memory); ROM (read-only memory) and distinguish between them.	
		1.1.3.2	Know storage capacity measurements: a bit, a byte, KB, MB, GB, TB.	

Category	Knowledge Area	Ref.	Knowledge Item	Page
		1.1.3.3	Know the main types of storage media, like an internal hard disk, an external hard disk, a network drive, a CD, a DVD, USB flash drive, a memory card and online file storage.	
	1.1.4 Output, Input Devices	1.1.4.1	Identify some of the main input devices, like a mouse, a keyboard, a trackball, a scanner, a touchpad, a stylus, a joystick, a web camera (webcam), a digital camera and a microphone.	
		1.1.4.2	Know some of the main output devices, like screens/monitors, printers, speakers and headphones.	
		1.1.4.3	Understand some devices are both input and output devices, like touchscreens.	
1.2 Software	1.2.1 Concepts	1.2.1.1	Understand the term „Software“.	
		1.2.1.2	Understand what an operating system is and name some common operating systems.	
		1.2.1.3	Identify and know the uses of some common software applications, like word processing, spreadsheet, database, presentation, e- mail, web browsing, photo editing and computer games.	
		1.2.1.4	Distinguish between operating systems software and applications software.	
		1.2.1.5	Know some options available for enhancing accessibility, like voice recognition software, screen reader, screen magnifier and an on-screen keyboard.	
1.3 Networks	1.3.1 Network Types	1.3.1.1	Understand the terms Local Area Network (LAN), Wireless Local Area Network (WLAN) and Wireless Area Network (WAN).	
		1.3.1.2	Understanding the term „Client/Server“.	
		1.3.1.3	Understand what the Internet is and know some of its main uses.	
		1.3.1.4	Understand what an intranet, an extranet is.	
	1.3.2 Data Transfer	1.3.2.1	Understand the concepts of downloading from and uploading to a network.	
		1.3.2.2	Understand what transfer rate means. Understand how it is measured: bits per second (bps), kilobits per second (kbps), and megabits per second (mbps).	
		1.3.2.3	Know about different Internet connection services, like a dial-up and broadband.	
		1.3.2.4	Know about different options for connecting to the Internet like a phone line, a mobile	

Category	Knowledge Area	Ref.	Knowledge Item	Page
			phone and a cable and wireless as well as satellite.	
		1.3.2.5	Understand some of the characteristics of broadband like always on, typically a flat fee, high speed, a higher risk of intruder attack.	
1.4 ICT Practical Applications in Everyday Life	1.4.1 Electronic World	1.4.1.1	Understand the term Information and Communication Technology (ICT).	
		1.4.1.2	Know about different Internet services for consumers, like e- commerce, e- banking, e- government.	
		1.4.1.3	Understand the term „e- learning“. Know some of its features, like flexible learning time, flexible learning location, multimedia learning experience and cost effectiveness.	
		1.4.1.4	Understand the term „Teleworking“; know some of the advantages of teleworking, like reduced or no commuting time, greater ability to focus on one task, flexible schedules and reduced company space requirements. Know some disadvantages of teleworking, like lack of human contacts, less emphasis on teamwork.	
	1.4.2 Communication	1.4.2.1	Understand the term „Electronic Mail“ (e- mail).	
		1.4.2.2	Understand the term „Instant Messaging“ (IM).	
		1.4.2.3	Understand the term „Voice over Internet Protocol“ (VoIP).	
		1.4.2.4	Understand the term „Really Simple Syndication Feed“ (RSS).	
		1.4.2.5	Understand the term „Web Blog“ (blog).	
		1.4.2.6	Understand the term „Podcast“.	
	1.4.3 Virtual Communities	1.4.3.1	Understand the concept of an online (virtual) community. Recognize examples, like social networking websites, Internet forums, chat rooms and online computer games.	
		1.4.3.2	Know ways that users can publish and share content online: web blog (blog), podcast, photos, video and audio clips.	
		1.4.3.3	Know the importance of taking precautions when using online communities: make your profile private, limit the amount of personal information you post, be aware that posted information is publicly available and be wary of strangers.	

Category	Knowledge Area	Ref.	Knowledge Item	Page
	1.4.4 Health	1.4.4.1	Understand the term „Ergonomics”.	
		1.4.4.2	Recognize that lighting is a health factor in computer use. Be aware that use of artificial light, amount of light and the direction of light are all important considerations.	
		1.4.4.3	Understand that correct positioning of a computer, desk and seat can help maintain a good posture.	
		1.4.4.4	Recognize ways to help ensure user’s wellbeing while using a computer, like take regular stretches, have breaks, use eye relaxation techniques.	
	1.4.5 Environment	1.4.5.1	Know about the option of recycling computer components, printer cartridges and paper.	
		1.4.5.2	Know about computer energy saving options: applying settings to automatically turn off the screen/monitor, to automatically put the computer to sleep, switching off the computer.	
1.5 Security	1.5.1 Identity/Authentication	1.5.1.1	Understand that for security reasons, a user name (ID) and a password are needed for users to identify themselves when logging on to a computer.	
		1.5.1.2	Know about good password policies, like not sharing passwords, changing them regularly, adequate password length, adequate letters and number mix.	
	1.5.2 Data Security	1.5.2.1	Understand the importance of having off-site backup copy of files.	
		1.5.2.2	Understand what a firewall is.	
		1.5.2.3	Know ways to prevent data theft, like using a user name and a password, locking computer and hardware using a security cable.	
	1.5.3 Viruses	1.5.3.1	Understand the term „Computer Virus”.	
		1.5.3.2	Be aware how viruses can enter a computer system.	
		1.5.3.3	Know how to protect a computer against viruses and the importance of updating antivirus software regularly.	
1.6 Law	1.6.1 Copyright	1.6.1.1	Understand the term „Copyright”.	
		1.6.1.2	Know how to recognize licensed software, like by checking the product ID, product registration and by viewing the software licence.	
		1.6.1.3	Understand the term „End User License	

Category	Knowledge Area	Ref.	Knowledge Item	Page
			<i>Agreement” (EULA).</i>	
		1.6.1.4	Understand the terms <i>shareware, freeware, open source.</i>	
	1.6.2 Data Protection	1.6.2.1	Identify the main purposes of the data protection legislation or conventions: to protect the rights of the data subject, to set out the responsibilities of the data controller.	
		1.6.2.2	Identify the main data protection rights for a data subject in your country.	
		1.6.2.3	Identify the main data protection responsibilities for a data controller in your country.	

Supplement No. 3.

Correct answers

Task 1.1. B – Mouse

Task 1.2. D – Spreadsheets

Task 1.3. C – Via the Internet

Task 1.5. B – Memorising it

The correct answers for the independent test:

Question	Correct answer
1.	A
2.	D
3.	B
4.	C
5.	B
6.	A
7.	B
8.	B
9.	C
10.	D
11.	B
12.	B
13.	C
14.	B
15.	B
16.	C
17.	C
18.	C
19.	C
20.	C
21.	C
22.	C
23.	C
24.	A
25.	B
26.	A
27.	A
28.	B
29.	A
30.	B