

Міністерство освіти і науки України

**НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ
«ОДЕСЬКА ПОЛІТЕХНІКА»**

ІНОЗЕМНА (АНГЛІЙСЬКА) МОВА

**МЕТОДИЧНІ ВКАЗІВКИ ДО ПРАКТИЧНИХ ЗАНЯТЬ З
АНГЛІЙСЬКОЇ МОВИ ДЛЯ ЗДОБУВАЧІВ І КУРСУ
СПЕЦІАЛЬНОСТІ G4.02 Енерговиробництво «Теплоенергетика та
енергоефективні технології»**

1 семестр

Одеса НУОП– 2024

1

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1 семестр

**Затверджено на засіданні кафедри
іноземних мов**

Протокол № 4 від 9.12.2025

2

Одеса НУОП- 2024

Методичні вказівки до практичних занять з англійської мови для здобувачів I курсу спеціальності G4.02 Енерговиробництво «Теплоенергетика та енергоефективні технології» 1 семестр/ Уклад.: Т.І. Борисенко, Л.М.Шапа, І.Ф.Дуванська, М.Г.Томенко – Одеса: НУОП, 2025. – 74с.

G4.02 Енерговиробництво «Теплоенергетика та енергоефективні технології»

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Передмова

Методичні вказівки для роботи зі здобувачами 1 курсу укладено відповідно до Програми вивчення іноземних мов у нефілологічному ВНЗ і спрямовано на розвиток у здобувачів немовних спеціальностей навичок читання та перекладу загально-технічних та науково-технічних текстів, збагачення словникового запасу і оволодіння навичками письма та говоріння.

Практичне володіння іноземною мовою в рамках даного курсу припускає наявність таких умінь, які дають можливість:

- вільно читати оригінальну літературу іноземною мовою у відповідній галузі знань;
- оформляти витягнуту з іноземних джерел інформацію у вигляді перекладу або резюме;
- робити повідомлення і доповіді іноземною мовою на теми, пов'язані з науковою роботою майбутнього фахівця;
- вести бесіду за фахом.

Кожний урок складається з тексту й комплексу мовних вправ, які розраховані на удосконалення навичок активізації словарного і граматичного мінімуму професійного спрямування.

“Методичні вказівки” забезпечують підготовку до міжнародного усного спілкування англійською мовою для спеціальних цілей, а саме - оволодіння лексичними, граматичними і стилістичними навичками, а також умінням читати, перекладати, згортати і розгортати усну англійськомовну інформацію наукового функціонального стилю.

Unit 1

Мета заняття: Знати і розуміти математику, фізику, хімію на рівні, необхідному для досягнення результатів освітньої програми українською мовою та хоча б однією із поширених європейських мов.

COMPUTER TECHNOLOGY. Part 1

A computer is an electronic device that performs high-speed mathematical or logical operations and executes instructions in a program. Its main functions are to accept and process data to produce results, store information and programs and show results.

The main characteristics of these powerful machines are: speed, as they can execute billions of operations per second high reliability in the elaboration and delivery of data storage of huge amounts of information

A computer consists of hardware and software. The word hardware refers to all the components you can physically see such as the CPU (Central Processing Unit), the internal memory system, the mass storage system, the peripherals (input and output devices) and the connecting system. Software, instead, comprises all the computer programs and related data that provide the instructions for a computer to work properly.

The CPU is the brains of your computer and consists of ALU (Arithmetic Logic Unit), which carries out the instructions of a program to perform arithmetical and logical operations, and CU (Control Unit), which controls the system and coordinates all the operations. In order to memorize input and output data, there is an internal memory that can be distinguished into volatile and non-volatile. Volatile memory is memory that loses its contents when the computer or hardware device is off. Computer RAM (Random Access Memory) is a good example of volatile memory. It is the main memory of the computer where all data can be stored as long as the machine is on. On the contrary, a non-volatile memory contains information, data and programs that cannot be modified, or can be modified only very slowly and with difficulty. Computer ROM (Read Only Memory), for example, contains essential and permanent information and software which allow the computer to work properly. Memory storage devices are available in different options, sizes and capacities. These devices are extremely useful; they can be rewritten and offer incredible storage capacity, up to 256 GB. They can be magnetic (hard disks), optical (CDs and DVDs) or solid (flash memory cards).

We call hardware the equipment involved in the functioning of a computer. It consists of several components that can either send data to the computer (input devices) or convert and transfer data out of the computer in the form of a text, sound, image, or other media (output devices). The main input and output devices are described below.

A monitor is the display, which helps you control computer operations. It accepts video signals from a computer and shows information on a screen. The first models used cathode ray tubes (CRTs). It was the dominant technology until they were replaced by liquid crystal displays (LCDs) in the 21st century.

A keyboard is like a typewriter with an arrangement of keys corresponding to written symbols. It is generally used to type text and numbers in a word processor. However, there are some special keys or combination of keys which, pressed simultaneously, can produce actions or computer commands.

A mouse is a dynamic pointing device used to move the cursor on the screen. It consists of a plastic case, a little ball that sends impulses to the computer when rolled on a flat surface, one or more buttons, and a cable that connects the device to the computer. Modern computers are provided with built-in pointing devices that let you control the cursor by simply moving your finger over a pad.

A scanner captures images from printed pages or photos and converts them into digital data. They usually come with software that lets you resize or modify a captured image. A printer receives text and graphics from a computer and transfers the information to paper. It may vary in size, speed, sophistication, and cost. In general, more expensive models are used for higher resolution colour printing.

A speaker converts electrical signals into sounds and allows you to listen to music, multimedia web sites and conversations with other people.

A modem is a device or program that enables a computer to transmit data over telephone lines, by converting digital signals into analog waves. It can be either internal or external to your computer.

Disk drives are devices that allow you to read and write data on disks. They can be either mounted inside the computer and store the computer operating system and all the documents and programs, or come in the form of removable devices.

Exercise 1. Read and memorize using a dictionary

backup _____ rebooting _____ case _____ robust _____
 _____ comprise _____ reliability _____
 compatible _____ removable _____ durable _____
 storage _____ execute _____
 volatile _____ perform _____ waterproof _____

Exercise 2. Work in pairs. Look at the picture and decide if the components are input (I) or output

mouse speaker modem keyboard printer disk drives monitor scanner



(O) devices.

Exercise 3. Complete the table.

Component (acronym)	Full name / Description	Function and properties
hardware		

software		
CPU		
ALU		
CU		
RAM		
ROM		

Exercise 4. Read the descriptions of the different types of computers and fill in the gaps with the words: fixed, intended, data, require, portable, surf, capabilities, reason, amounts, inside.

Desktop: this is a personal computer 1) _____ for regular use at a single location. It's designed to sit on your desk, and as such it consists of a monitor and a tower with extra drives 2) _____.

Laptop: this is a 3) _____ computer, which integrates all the usual components of a desktop computer into a single unit. Smaller versions of laptops are known as notebooks. It is useful for people who do not have a 4) _____ place to work at. They are lighter and handier than desktop computers, but they also tend to be more expensive. They require an expensive battery that needs to be recharged quite often.

Netbook: this is a portable computer, with limited 5) _____ as compared to standard laptops. It is smaller and lighter, but it also has less processing power than a full-sized laptop. It is useful for people who don't have a fixed place to work at or for those who travel, but still need to 6) _____ the Net. They use a battery which needs to be recharged often.

Palmtop: this is a small portable computer designed to have large 7) _____ of information close to hand. They are provided with light long- lasting batteries and special operating systems. They don't require any keyboard but use special pens or touch screens to enter 8) _____ and access information.

Mainframe: this is a very large and expensive computer capable of supporting thousands of users at the same time. For this 9) _____, it is used in businesses and it's the centre of computer networks. These super computers, which are usually as big as a large refrigerator, are the most powerful and expensive ones and they're used for jobs which 10) _____ enormous amounts of calculations, such as weather forecasting, engineering design and economic data processing.

Exercise 5. Answer the questions.

What does a desktop computer consist of?

Are desktop computers designed to be carried around?

Who are laptops useful for?

What is the difference between a netbook and a laptop?

How can you access or enter information on a palmtop?

What are mainframes used for? Exercise 6. Ask questions to the given answers:

Question: _____ ?

Answer: In order to memorize input and output data, there is an internal memory that can be distinguished into volatile and non-volatile.

Question: _____ ?

Answer: It is the main memory of the computer where all data can be stored as long as the machine is on.

Question: _____ ?

Answer: Software, instead, comprises all the computer programs and related data that provide the instructions for a computer to work properly.

Question: ____ ?

Answer: Computer ROM (Read Only Memory), for example, contains essential and permanent information and software which allow the computer to work properly.

Exercise 7. Match the words and word-groups with their definitions:

1 capacity	a) strong; sturdy in construction; able to withstand or overcome adverse conditions
2 elaboration	b) the process of restarting a working computer using hardware (e.g., a power button) instead of software
3 robust	c) the maximum amount that something can contain
4 volatile memory	d) a copy of a file or other item of data made in case the original is lost or damaged
5 essential	e) the process of developing or presenting a theory, policy, or system in further detail
6 durable	f) computer storage that only maintains its data while the device is powered
7 rebooting	g) of the utmost importance
8 backup	h) able to withstand wear, pressure, or damage

Exercise 8. How much do you know about computers? Work in pairs and answer the questions.

What is a computer?

What does a computer do?

What are the main components of a computer?

Have you got a computer at home? What type is it?

What do you generally use your computer for?

Unit 2

Мета заняття: Знати і розуміти інженерні науки, що лежать в основі спеціальності «Теплоенергетика» відповідної спеціалізації, на рівні, необхідному для досягнення інших результатів освітньої програми, в тому числі певна обізнаність в останніх досягненнях науки і техніки у сфері теплоенергетики.

COMPUTER TECHNOLOGY. Part 2

The Internet is a worldwide information system consisting of countless networks and computers, which allow millions of people to share information and data. Thanks to the Internet it is now possible for people all over the world to communicate with one another in a fast and cheap way. The Internet was first invented in the 1960s in the USA by the Department of Defence as an internal project to link computers. The Department wanted an extremely safe way of sending messages in case of nuclear attack. It was a British physicist, Sir Timothy Berners-Lee, who used it to make information available to everyone and created the most important media of the 21st century. In 1980 while working at CERN in Geneva - the largest particle physics laboratory in the world - he first thought of using hypertext to share and update information among researchers. Then in 1989-90 he produced a plan to link hypertext to the Internet to create the World Wide Web. He designed and built the first site browser and editor, as well as the first web server called httpd (Hypertext Transfer Protocol Deamon). Hypertext are the words or chains of words in a text we can click on to be linked to new sites whose content is related to the words. But how does this global system work? It is a network of people and information linked together by telephone lines which are connected to computers. The applications are based on a client/server relationship, in which your computer is the client and a remote computer is the server. All you need to join this system is a computer, a normal telephone line, a modem and an account with an Internet Service Provider (ISP), a company that provides access to the Internet. A user buys a subscription to a service provider, which gives him/her an identifying username, a password and an email address. With a computer and a modem, the user can connect to the service provider's computer which gives access to many services, such as WWW (world wide web), emails and FTP (file transfer protocol).

The World Wide Web has been central to the development of the Information Age and is the primary tool billions of people use to interact on the Internet. Web pages are primarily text documents formatted and annotated with Hypertext Markup Language (HTML). In addition to formatted text, web pages may contain images, video, audio, and software components that are rendered in the user's web browser as coherent pages of multimedia content.

FTP is a standard network protocol used for to transfer computer files between a client and server on a computer network.

FTP is built on a client-server model architecture and uses separate control and data connections between the client and the server. FTP users may authenticate themselves with a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it. For secure transmission that protects the username and password, and encrypts the content.

A host that provides an FTP service may provide anonymous FTP access. Users typically log into the service with an 'anonymous' (lower-case and case-sensitive in some FTP servers) account when prompted for username. Although users are commonly asked to send their email address instead of a password, no verification is actually performed on the supplied data. Many

FTP hosts whose purpose is to provide software updates will allow anonymous logins.

Exercise 1. Read and memorize using a dictionary

_____ countless palmtop
 _____ interfere recharge
 _____ keyboard
 _____ sophistication
 landline subscription _ laptop
 tower _ mainframe _ typewriter

Exercise 2. Match each sentence with its ending.

1	Thanks to the Internet it is now possible for people all over the world	a	to be linked to new sites whose content is related to the words.
2	Hypertext are the words or chains of words in a text we can click on	b	which gives him/her an identifying username, a password and an email address.
3	The applications are based on a client/server relationship..	c	to communicate with one another in a fast and cheap way.
4	The Department wanted an extremely safe way	d	in which your computer is the client and a remote computer is the server
5	A user buys a subscription to a service provider,	e	of sending messages in case of nuclear attack.

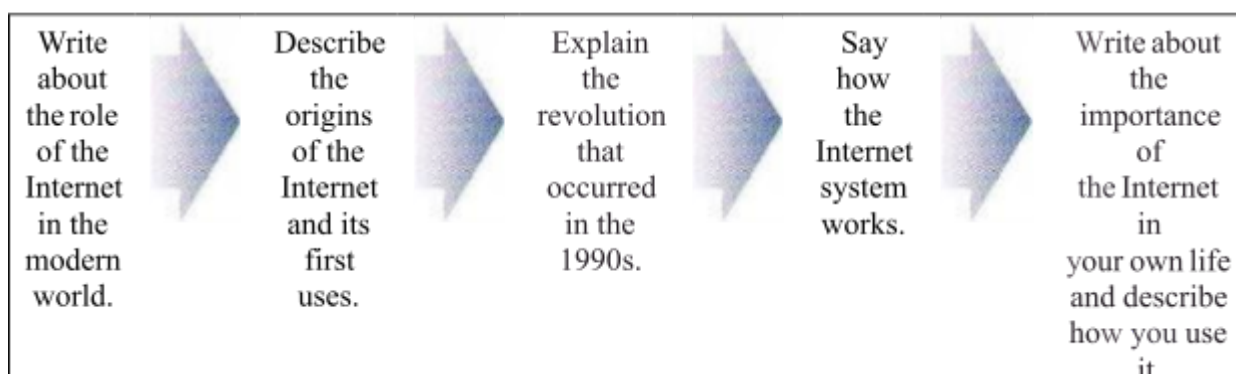
Exercise 3. Complete the sentences with the missing information.

The Internet allows people to _ In
 the 1960s, the Internet was used
 Thanks to Sir Timothy Berners-Lee
 He created the World Wide Web by linking

All you need to access the Internet is _____

The ISP is _____

Exercise 4. Write a summary of the text following the flow chart.



Exercise 5. Read about the different types of Internet connections and match the words: *DSL, wireless, satellite, cable, dial-up* with the correct definition.

It used to be the most common way to access the Internet. This type of connection requires you to use a landline telephone connection and a modem connected to your computer. In order to establish the connection, you must dial a telephone number provided by the ISP. Nowadays it represents the cheapest but slowest way to connect to the Internet. Another disadvantage of this type of connection is that you cannot make or receive phone calls while connected to the Internet.

A digital subscriber line is another way to connect to the Internet through a telephone connection, but the quality and speed of the connection is significantly greater than a dial-up connection. Moreover, unlike a dial up connection, this connection is always on, which means you can still make and receive telephone calls with your landline telephone.

In order to have this type of connection you must subscribe to an account with a local cable television provider and connect a cable modem to your computer. This connection is very fast and doesn't interfere with your telephone line.

This is one of the newest Internet connection types. This connection does not require your computer to be connected to telephone or cable wires, as it uses radio frequency bands. You simply need a modem and an account with an Internet provider. Nowadays, many coffee shops, restaurants, public libraries and schools offer this type of connection for free. However, it is typically more expensive and mainly available in metropolitan areas.

This type of connection allows a user to access the Internet via a satellite that orbits the earth. Because of the enormous distances signals must travel, this connection is slightly slower than terrestrial connections through cables. It represents an excellent option for people living in rural areas where other types of connections are not available.

Exercise 6. Read the text about USB flash drives and fill in the gaps with the words in the box.

plugged backup board moving disadvantage operating system case off-site water pocket

Mass storage devices are available in an incredible number of options with different storage capacity up to 256 GB for some portable drives. A very popular type of removable device is represented by USB flash drives, which are much smaller and lighter than other portable drives, but which can still provide a huge storage capacity.

A USB flash drive is a flash memory data storage device integrated with a USB (Universal Serial Bus) interface. USB flash drives are removable and rewritable, and they are small enough to be carried in a (1) . These portable drives are faster, have thousands of times more capacity, and are more durable and reliable than CD-ROMs because of their lack of (2) parts. Unlike most removable drives, a USB drive does not require rebooting after it's attached, they are very robust and use very little power. They just need to be (3) plugged into a USB port to work and they're compatible with any modern (4) operating system, such as Linux, Mac OS X and Windows.

A flash drive consists of a small printed circuit (5) _____ carrying the circuit elements and a USB connector, insulated electrically and protected inside a plastic (6) _____. The drive is often used as a (7) _____ medium ~~to save data~~, because it is very user-friendly and it can be carried (8) _____ for safety ~~despite~~ being large enough for several backups. Moreover, flash drives are cheaper and less fragile than many other backup systems. Some specially manufactured flash drives are provided with a metal or rubber case designed to be waterproof and almost unbreakable. It's been tested that these flash drives can retain their memory even after being submerged in (10) _____, put in a washing machine and run over with a car. Exercise 7. Find the synonyms for the following words in the text.

- | | | | | | | |
|---|----------|-------|---|-------------|-------|---------|
| 1 | long- | _____ | 4 | easy to use | _____ | lasting |
| 2 | sturdy | _____ | 5 | fabricated | _____ | |
| 3 | inserted | _____ | 6 | hold | _____ | |

Exercise 8. Decide if the following statements are true (T) or false (F), then correct the false ones.

Flash drives are provided with a very limited storage capacity. _____

They are lighter than other removable drives. _____

They need an external power supply to work. _____

USB flash drives are compatible with few operating systems. _____

A plastic case prevents the printed circuit board from being damaged. _____

USB drives are convenient for transferring data between computers or for personal backups.

They are more expensive than other backup systems. _____

Some models continue to work even after being accidentally dropped into water.

Unit 3

Мета заняття: Знати і розуміти математику, фізику, хімію на рівні, необхідному для досягнення результатів освітньої програми українською мовою та хоча б однією із поширених європейських мов.

AUTOMATION AND ROBOTICS

Mechanisation refers to the process of providing human beings with machinery capable of assisting them with the muscular requirements of work. A further development of mechanisation is represented by automation, which implies the use of control systems and information technologies to reduce the need for both physical and mental work to produce goods.

Automation has had a great impact on industries over the last century, changing the world economy from industrial jobs to service jobs. In manufacturing, where the process began, automation has meant that the desired results can be obtained through a series of instructions made automatically by the system, which define the actions to be done. Automated manufacturing grants higher consistency and quality, while reducing lead times and handling. It also improves work flow and increases the morale of workers when a good implementation of the automation is made.

However, the purpose of automation cannot be seen only in terms of a reduction of cost and time; there are several more aspects to be taken into consideration. For example, while it is true that automation offers a higher precision in the manufacturing process, it is also true that it requires skilled workers who can make repairs and manage the machinery.

The following table sums up the main advantages and disadvantages of automation:

Advantages	Disadvantages
Speeding up the developmental process of society	Disastrous effects on the environment (pollution, traffic, energy consumption)
Replacing human operators in tasks that involve hard physical or monotonous work	Sharp increase in unemployment rate due to machines replacing human beings
Saving time and money as human operators can be employed in higher-level work	Technical limitations as current technology is unable to automate all the desired tasks
Replacing human operators in tasks done in dangerous environments (fire, space, volcanoes, nuclear facilities, underwater)	Security threats as an automated system may have a limited level of intelligence and can make errors
Higher reliability and precision in performing tasks	Unpredictable costs due to research and development, which may exceed the cost saved by the automation itself
Economy improvement and higher productivity	High initial costs as the automation of a new product requires a large initial investment

Numerical control over automated devices has resulted in a rapidly expanding range of applications and human activities. Computer-aided technologies (CAx) is a broad term that means the use of computer systems to aid in the design, analysis, and manufacture of products, by serving the basis for mathematical and organisational tools used to create complex systems. It includes computer-aided design (CAD software) and computer-aided manufacturing (CAM software).

The current limit of computer-aided technologies is that some abilities are well beyond the capabilities of modern mechanical and computer systems. Moreover, these technologies require high-skilled engineers and the synthesis of complex sensory data to work properly. As for costs

involved, in some cases, automation is more expensive than mechanical approach. Thanks to the incredible improvements in automation technology, a number of other technologies have developed from it, such as domotics and robotics.

Domotics is a field in building automation aimed at the application of automation technologies in households for the comfort and security of its residents. This means that lights, heating and conditioning systems, windows shutters, kitchen equipment and surveillance systems can be controlled by a remote control or even by a cell phone at a distance.

Robotics is a special branch of automation in which the automated machines have certain human features and are used to replace human workers in factory operations. Robots are computercontrolled mechanical devices that are programmed to move, manipulate objects and interact with the environment. Nowadays more and more sophisticated robots are being built to serve various practical purposes, for example in houses, businesses, in the army and for medical appliances for disabled people.

Exercise 1. Read and memorize using a dictionary.

to aid _____ manufacturing _____
 beyond _____ nowadays _____ bounce off _____
 _____ pattern _____ broad _____
 _____ pick up _____ diode _____
 _____ requirement disabled _____ shutter _____
 _____ discriminate _____
 surveillance _____
 go underwater _____ task _____ goods _____
 _____ transducer _____ handling _____ unemployment rate
 _____ lead time _____ work flow _____

Exercise 2. Match the words with their definition.

manufacturing a) the time between the design of a product and its production
 information technologies b) the amount of confidence that a group of people
 have goods c) a set of tasks performed to complete a procedure service jobs d)
 the process of packing and distributing goods skilled e) the industry in which
 machinery is used to produce goods morale f) the development and application of
 computer systems unemploymentg) having the knowledge and the ability to do
 something lead times h) things that are made to be sold handling i) jobs in
 transports, communications, hospitals, energy industry work flow j) the state of not
 having a job

Exercise 3. What would you like to automate in your life? In pairs, discuss the impact of automation on your own life and list its main advantages and disadvantages.

Exercise 4. Answer the questions

What does computer-aided technologies mean?

Which software does CAx include?

What are the current limits of CAx?
Can you name two applications of automation technologies?
How does a domotic house differ from a traditional house?
What are robots used for?

Exercise 5. In pairs, think of what robots can do nowadays and tick the boxes below.

Nowadays robots can get
sick see obstacles
go underwater speak fluently handle
dangerous material smell things clean
nuclear waste taste food explore
volcanoes move objects go to space have
feelings
easily walk on two legs

Exercise 6. Read the text about sensors and match each paragraph with a heading.

Sensor applications Types of sensors What is a sensor?

Almost every industrial process requires the use of sensors and transducers, which are very advanced devices capable of measuring and sensing the environment and translating physical information (e.g. variations of light, pressure, temperature and position) into electrical signals. The sensor picks up the information to be measured and the transducer converts it into electrical signals that can be directly processed by the control unit of a system.

Because of the industrial and scientific importance of measuring, sensors are widely used in a variety of fields, such as medicine, engineering, robotics, biology and manufacturing. Traditional machines have difficulty measuring small differences in product size, so sensors can be particularly useful as they can discriminate down to 0,00013 millimetres. They can also detect temperature, humidity and pressure, acquire data and alter the manufacturing process. Sensors are also vital components of advanced machines, such as robots.

There are two types of sensors: analogue and digital. Analogue sensors operate with data represented by measured voltages or quantities, while digital ones have numeric or digital outputs which can be directly transmitted to computers.

The sensors usually employed in manufacturing are classified as mechanical, electrical, magnetic and thermal, but they can also be acoustic, chemical, optical and radiation sensors. Moreover, according to their method of sensing, they can be tactile or visual. Tactile sensors are sensitive to touch, force or pressure and they are used to measure and register the interaction between a contact surface and the environment. These sensors are used in innumerable everyday objects, such as lift buttons and lamps which turn on and off by touching the base. Visual sensors, instead, sense the presence, shape and movement of an object optically. They are becoming more and more important in surveillance systems, environment and disaster monitoring and military applications.

Exercise 7. Read the text again and choose the correct answer.

Sensors pick up _____ to be measured.

electrical signals

physical

information the

control unit

Physical data is translated into electrical signals by

. A the transducer the sensor a computer

Sensors _____ used to alter the manufacturing process.

can't be are never can be _____ sensors can transmit

data directly to computers.

A Chemical

Digital

Analogue

Tactile sensors are commonly used in _____. A

everyday objects military applications

sophisticated machinery _____ sensors are used

to localize objects in space

Analogue

Visual

Tactile

Exercise 8. Read the text about the computer mouse and underline the correct option:

A common example of the application of sensors to everyday objects is the computer mouse. The mechanical mouse has a ball which rotates and translates the (1) *motion/temperature* of our hand into signals that the computer can use.

Developed in late 1999, the optical mouse is an advanced computer pointing device that uses a light-emitting diode (LED), an (2) *acoustic/optical* sensor and a digital signal processor (DSP) in place of the traditional mouse ball and electromechanical transducer. The optical mouse actually uses a tiny (3) *camera/recorder* to take thousands of pictures at a rate of more than 1,000 images per (4) *minute/second*.

Optical mice can work on many surfaces without a mouse pad, thanks to an LED that bounces light off the surface it is on onto an optical sensor. The sensor sends each image to a digital signal (5) *processor/transistor* which examines how the patterns have moved since the previous image, determining how far the mouse has moved. The computer then moves the cursor on the screen based on the coordinates received from the mouse. This happens hundreds of times each second, making the cursor appear to move very (6) *slowly/smoothly*.

The best surfaces reflect but some others, for example a blank sheet of white (7) *plastic/paper*, do not allow the sensor and DSP to work properly because the details are too small to be detected.

In addition to LEDs, a recent innovation are laser- based optical mice that detect more surface details compared to LED technology. This results in the ability to use a mouse on almost any surface and to (8) *reduce/increase* the resolution of the image.

Exercise 9. Read the text again and match each sentence with its ending.

A mechanical mouse a) the optical mouse was developed.

There are no sensors b) provide high-resolution images.

In late 1999 c) can reflect light in the same way.

An optical mouse d) in a mechanical mouse.

A DPS e) has got a scroll ball mechanism inside.

Not all surfaces f) uses a light-emitting diode, an optical sensor and a DSP Laser-based optical mice g) is a processor for digital signals.

Unit 4

Мета заняття: Знати і розуміти інженерні науки, що лежать в основі спеціальності «Теплоенергетика» відповідної спеціалізації, на рівні, необхідному для досягнення інших результатів освітньої програми, в тому числі певна обізнаність в останніх досягненнях науки і техніки у сфері теплоенергетики.

TECHNOLOGY TRENDS

Artificial intelligence (AI), largely manifesting through machine learning algorithms, isn't just getting better. It's being incorporated into a more diverse range of applications. Rather than focusing on one goal, like mastering a game or communicating with humans, AI is starting to make an appearance in almost every new platform, app, or device, and that trend is only going to accelerate. We're not at techno-pocalypse levels (and AI may never be sophisticated enough for us to reach that point), but soon AI will become even more of a mainstay in all forms of technology.

Over the past decade, we've seen the debut of many different types of devices, including smart phones, tablets, smart TVs, and dozens of other "smart" appliances. We've also come to rely on lots of individual apps in our daily lives, including those for navigation to even changing the temperature of our house. Consumers are craving centralization; a convenient way to manage everything from as few devices and central locations as possible. Smart speakers are a good step in the right direction.

Though tech timelines rarely play out the way we think, it's possible that we could have a 5G network in place—with 5G phones—in a few years. 5G internet has the potential to be almost 10 times faster than 4G, making it even better than most home internet services. Accordingly, it has the potential to revolutionize how consumers use internet and how developers think about apps and streaming content. Next year is going to be a year of massive preparation for engineers, developers, and consumers, as they gear up for a new generation of internet.

By now, every company in the world has realized the awesome power and commoditization of consumer data, and next year, data collection is going to become an even higher priority. With consumers talking to smart speakers throughout their day, and relying on digital devices for most of their daily tasks, companies will soon have access to—and start using—practically unlimited amounts of personal data. This has many implications, including reduced privacy, more personalized ads, and possibly more positive outcomes, such as better predictive algorithms in healthcare.

Is your job likely to be replaced by a machine? How certain are you of that answer? AI has been advancing enough to replace at least some white collar jobs for years; even back in 2013, we had algorithms that could write basic news articles, given sufficient inputs of data. Is next year going to be the year all humans are finally replaced by their new robot overlords? Almost certainly not, but we can see the fledgling beginnings of radical job transformations. Jobs will not be fully replaced, but they will be more heavily automated, and we'll have to adapt our careers accordingly.

Exercise 1. Read and memorise using a dictionary.

artificial intelligence _ mainstay _____
 await _____ manifestation _____ awesome _____
 predictive _____ consequence _ rely on _____
 diverse _____ seamless _____
 exposure sophisticated _ flawless streaming _ fledgling _ sufficient implication _____
 voice recognition _____

Exercise 2. Match each paragraph of the text with a heading.

White collar automation	AI permeation
Data overload	Digital centralization
5G preparation	

Exercise 3. Answer the following questions:

What is starting to make an appearance in almost every new platform, app, or device?
 What have we seen over the past decade?
 What is AI being incorporated into?
 Why are consumers craving centralization?
 When is it possible that we could have a 5G network?
 What potential has 5G internet?
 Who will soon have access to practically unlimited amounts of personal data?
 What jobs has AI been advancing enough to replace?

Exercise 4. Match the left part with the right:

1. Jobs will not be fully replaced, but they will be more heavily automated,	a) including those for navigation to even changing the temperature of our house.
2. Next year is going to be a year of massive preparation for engineers, developers,	b) and we'll have to adapt our careers accordingly.
3. We've also come to rely on lots of individual apps in our daily lives,	c) including smart phones, tablets, smart TVs, and dozens of other "smart" appliances.

4. We're not at techno-pocalypse levels (and AI may never be sophisticated enough for us to reach that point),	d) and consumers, as they gear up for a new generation of internet.
5. Over the past decade, we've seen the debut of many different types of devices,	e) but soon AI will become even more of a mainstay in all forms of technology.

Exercise 5. Complete the text with the words in the box.

sophisticated	hiccups	exposure	await
unreliable	solidification	recognizing	onset
core	flawless		

Seamless conversation. A few years ago, voice search was decent, but 1 __. Today, voice search might as well be 2 __; Microsoft's latest test gives its voice recognition software a 5.1 percent error rate, making it better at 3 __ speech than human transcribers. Similarly, robotic speech and chatbots are growing more 4 __. Next year with these improvement cycles continuing, we'll see the manifestation or 5 __ of seamless conversation. We'll be able to communicate with our devices, both ways, without any major 6 __ or mistakes. UI overhauls. Next year is going to be a major year for UI; we're going to have to rethink how we interact with our apps and devices. The 7 __ of smart speakers and better voice search has made it so it's no longer necessary to look at a screen to input data. Desktop devices are becoming less and less used as well, with mobile continuing to take over. New types of visuals and more audible clues will likely be included in next-generation UI, and consumers will adapt to them quickly, so long as they serve their 8 __ needs.

It's hard to say how fast these trends will manifest, or what types of devices and upgrades will dictate their development, we'll see increased 9 __ on all these fronts.

Regardless of how you feel about technology, or your primary motivations for using it, we can all be excited about the new gadgets and infrastructure that 10 ____ us next year.

Exercise 6. Ask questions to the given answers:

Question: ____ ?

Answer: The onset of smart speakers and better voice search has made it so it's no longer necessary to look at a screen to input data.

Question: ____ ?

Answer: We've also come to rely on lots of individual apps in our daily lives, including those for navigation to even changing the temperature of our house.

Question: ____ ?

Answer: Jobs will not be fully replaced, but they will be more heavily automated, and we'll have to adapt our careers accordingly.

Question: ____ ?

Answer: Consumers are craving centralization; a convenient way to manage everything from as few devices and central locations as possible.

Exercise 7. Match the words and word-groups with their definitions:

1 artificial intelligence	a) an event, action, or object that clearly shows or embodies something abstract or theoretical
2 navigation	b) the conclusion that can be drawn from something although it is not explicitly stated
3 commoditization	c) the theory and development of computer systems able to perform tasks normally requiring human intelligence
4 implication	d) smooth and continuous talk, with no apparent gaps or spaces between one part and the next
5 outcome	e) the process or activity of accurately ascertaining one's position and planning and following a route
6 seamless conversation	f) the act of making a process, good or service easy to obtain by making it as uniform, plentiful and affordable as possible
7 manifestation	g) the condition of being presented to view or made known or being subject to some effect or influence
8 exposure	h) the way a thing turns out; a consequence

Exercise 8. Give the words that have similar meanings (synonyms):

seamless -
artificial - diverse
– sophisticated –
awesome –
sufficient – decent
– flawless –

Unit 5

Мета заняття: Вміти знаходити необхідну інформацію в технічній літературі, наукових базах даних та інших джерелах інформації, критично оцінювати і аналізувати її

WHAT IS ELECTRONICS?

Electronics is the branch of science which controls electricity in order to convey a signal using semiconductor materials. These signals represent numbers, letters, sounds, pictures, computer instructions or other information. Radio systems were developed to read and understand these signals and in 1920 radio broadcasting started, making it possible for electromagnetic waves to travel long distances.

More sophisticated devices were needed during the Second World War and the invention of radar (Radio Detection and Ranging) represented a further step in electronics, making it possible to determine the altitude, direction and speed of moving and fixed objects.

The invention of television in the 1920s was one of the most revolutionary and popular inventions in history and it showed the importance of electronics in certain branches of industry. For the first time in history it became possible to transmit images and sound over wire circuits.

The first computer appeared in 1946. This machine, which could solve a wide range of computing problems, was built over a period of three years by a team of American scientists working at the University of Pennsylvania. It was a huge machine weighing almost 50 tons.

The first transistor was assembled in 1957 by a team of scientists working at the Bell Laboratories in the U.S.A, and it was a real coming of age in the science of electronics because it replaced the use of valves. Transistors are very small, easy to handle, cheap, and they use little power.

The silicon chip - which followed the transistor in the 1960s - can contain up to several thousand transistors packed and interconnected in layers beneath the surface. It is really tiny (usually less than one centimetre square and about half a millimetre thick) and it has paved the way to microelectronics.

Electronics has influenced and improved the way information is stored, processed and distributed. Social and personal life has been deeply affected by these inventions and many financial, business, medical, education and political routines have been speeded up.

The integrated circuit, also known as a chip, is one of the most important inventions of the 20th century. Integrated circuits are used in almost all electronic equipment today, for example watches, calculators and microprocessors. It consists of millions of transistors and other electronic components combined to form a complex set on a thin slice of silicon or other semiconductor material. Chips are becoming tinier and tinier and they are produced in large quantities so that costs are reduced. Since signals have to travel a short distance, they work faster, consume less power and generate less heat. They are also more reliable given the limited amount of connections which could fail.

The microprocessor is the heart of any normal computer: it is a logic integrated circuit chip which can carry out a sequence of operations when it receives instructions from different input devices. As it doesn't contain a large memory, it can't work alone but needs to be supported by other integrated circuits to be connected with peripherals. Most microprocessors are found inside computers and are called the CPU (Central Processing Unit). In order to work properly, the microprocessor needs to receive instructions from a memory chip. These instructions are then decoded, executed and 'elaborated' so as to get the results available. The most sophisticated microprocessors can contain up to 10 million transistors and run 300 million cycles per second.

It means that the computer can perform about a billion instructions every second. As technology continues to evolve, microprocessors are becoming tinier and tinier.

Exercise 1. Read and memorize using a dictionary.

branch _____	outgoing _____
breadboard _____	peripheral _____ broadcasting _____
	slice _____
convey _____	soldering _____
decode _____	to speed up _____
_____ further _____	spring clip _____
_____ huge _____	tiny _____
_____ incoming _____	wave _____
_____ layer _____	

Exercise 2. Complete the table with the missing information.

Invention	Year	Function
		read and understand electronic signals
Radar		

Exercise 3. Think of an electronic device (TV, radio, mobile phone, computer, etc.) you see every day. Write about its use, advantages, disadvantages and your opinion of it. Write about 60 words.

Exercise 4. Answer the questions.

What is a conventional circuit made of?

What does PCB stand for?

What is a breadboard?

What does a chip consist of?

What is a chip made out of?

What are the advantages of chips compared to conventional electronic circuits?

What is a microprocessor?

How many instructions can computers perform?

Exercise 5. Read the text again and match the words with their definitions. prototype a) to convert an electrical signal into another code perforated b) the act of joining metallic parts

soldering c) an original model used to test a circuit or a product to fail d) to perform ineffectively peripheral e) having a series of holes to decode f) an auxiliary device that works with a computer

Exercise 6. Read the text about mobile phones and complete it with the words in the box.

cell	lines	microprocessor	photos	radio	signals
	flash	Emails	antenna	movement	

A cellular phone (or mobile phone) is designed to give the user freedom of (1) _ while using a telephone. It uses (2) _ signals to communicate between the phone and the (3) _ . The server area is divided into smaller areas called cells. An antenna is placed within each cell and connected by telephone (4) ____ . These lines connect cellular phones to one another: a computer selects the antenna closest to the telephone when a call is made. If the phone moves to one serving (5) _____ to another, the radio signal is transferred to the actual cell without interrupting the conversation. The circuit board is the heart of the system. A chip translates the outgoing and incoming (6) _____ from analogue to digital and back from digital to analogue. The (7) _____ handles all the functions for the keyboard, the display and the loudspeakers, and it controls the signal to the base station. Other (8) _____ memory chips provide storage for the operating system. A cellular phone is not only a phone but it provides an incredible amount of functions: store information; use a calculator; send and receive (9) _; surf the Internet; play simple games; play music, take (10) and videos.

Can you imagine your life without your mobile phone?

Exercise 7. In pairs, decide if the following statements are true (T) or false (F).

Mobile phones use radio signals to communicate.

The server area is divided into smaller areas called stations.

An antenna is placed every two or three cells.

Communication with a mobile within a cell is independent from the base station.

There are interruptions when you move to one cell to another.

The antenna is the heart of the system.

The signal must be translated.

The flash memory handles all the functions.

Loudspeakers are controlled by the microprocessor.

You can text and send emails with your mobile phone.

Exercise 8. Ask questions to the given answers:

Question: ?

Answer: A cellular phone uses radio signals to communicate between the phone and the antenna.

Question: ? Answer: The server area is divided into smaller areas called cells.

Question: ?

Answer: If the phone moves to one serving cell to another, the radio signal is transferred to the actual cell without interrupting the conversation.

Question: ____ ?

Answer: The microprocessor handles all the functions for the keyboard, the display and the loudspeakers, and it controls the signal to the base station.

Unit 6

Мета заняття: Знати і розуміти математику, фізику, хімію на рівні, необхідному для досягнення результатів освітньої програми українською мовою та хоча б однією із поширених європейських мов.

TELECOMMUNICATIONS AND NETWORKS

Communication has always played a crucial role in human societies and over time its forms have evolved through the progression of technology, transforming itself into telecommunication. The telegraph, the telephone, the radio, the television, the radar, the fax and, more recently, the computer are all devices which were invented to communicate using electromagnetic waves. Thanks to them, we can transmit texts, pictures, sounds and images and reach everyone in any part of the world.

Ground transmission

Wires provide a cheap and effective means of communication that was predominant in the past. Wires, which are made out of copper and insulated with plastic, can be single or twisted, and they are used mainly in telephone and computer networks.

Coaxial cables consist of an inner conductor insulated with plastic and surrounded by a woven copper shield. They are used in television and radio as these cables can support about 60 channels. The inner copper cable is insulated to protect the wires from bending and crushing and to reduce the noises.

Optical fibres are used in place of simple copper wires to carry larger amounts of information. They consist of strands of pure glass as thin as a human hair. Signals travel along fibres with less loss and without any electromagnetic interference. As they permit transmission over longer distances and at a higher speed, they are used in communication systems, in some medical instruments and in a wide variety of sensing devices.

Air transmission

Antennas were invented to capture radio signals and convert them into electrical signals through the receiver. They can also receive electrical signals from the transmitter and convert them into radio signals.

These electric devices, which provide information at a cheap rate, are essential to all equipment that uses radio. They are used in systems such as radio and television broadcasting, radar, mobile phones, and satellite communications, for which they are in form of dishes.

Satellites are machines launched into space to move around Earth or another celestial body. A communications satellite is basically a station which receives signals in a given frequency and then retransmits them at a different frequency to avoid interference problems. The first satellite was launched by the Soviet Union in 1957. There are different types of satellites: low- orbit satellites, which travel at about 300 km from the Earth and observe the planet, providing accurate information about agriculture, pollution and weather forecasting; medium-altitude satellites, which travel at about 9000-18000 km from the Earth and are used in telecommunications. Exercise 1. Read and memorize using a dictionary

backbone ____
device

receiver _____

bending

sensing

coaxial _____ share _____ dish _____
 forecasting _____ to surround — grant
 strand _____ shield down _____ go
 hub — transmitter token
 inner _____ twist link _ up-to-date _____
 reach _____
 woven .

Exercise 2. Complete the table.

Means of transmission	Material	Function	Type of signal (ground or air)	Advantages
wires				
coaxial cables				
optical fibres				
antennas				
satelites				

Exercise 3. Read the text about networks and answer the questions



A network is a group of computers linked together. It consists of at least two computers joined by cables on the same desk or same office, but it can also mean thousands of computers across the world. The users of a network can share hardware (scanner, printer, fax machine, etc.), access data in other people's computers and run other programs stored in the network although not installed on their own computer.

A network consists of: nodes, that is to say different computers and devices; a connecting medium, such as cables or a wireless connection; routers, which are special computers enabled to send messages; switches, that is to say devices which help to select a specific path to follow. Networks can be connected in different ways according to the area they cover.

A LAN (Local Area Network) is generally located in a limited space, such as a building or a campus.

On the contrary, a WAN (Wide Area Network) operates in a larger area and it can reach most of the world, so it could be described as a collection of LANs all over the world.

The exchange of information in a network is controlled by communications protocols, which define the formats and rules that computers must follow when talking to one another.

Well-known communications protocols are Ethernet, which is a family of protocols used in LANs, and the Internet Protocol Suite, which is used in any computer network. Computer networks offer many advantages. For example, they facilitate communication, allowing people to send emails and texts, make phone/video calls and videoconference.

Furthermore, networks allow people to share files, data, and other types of information as users may access data and information stored on other computers in the network.

On the other hand, networks may be difficult to set up and may be insecure as computer hackers can send viruses or computer worms to the net computer. They may also interfere with other technologies, as power line communication strongly disturbs certain forms of radio communication and access technology such as ADSL.

What does a network consist of?

What is a router?

What is a LAN?

What is a WAN?

What is the function of communications protocols?

What is Ethernet used for?

What are the advantages of using a network?

What are the disadvantages of using a network?

Exercise 4. Work in pairs. Think of different means of communication and take turns asking and answering the following questions.

How often do you use them?

What do you use them for?

Who do you use them with?

What are their advantages?

Can you think of any risk connected with their use?

Exercise 5. Look at the table and complete the text about telecommunication systems.

Means of transmission	
cables: wires, coaxial cables, optical fibres	radio waves: antennas, satellites

Telecommunication systems need means for the (1) _____ of any information, which is translated into electromagnetic waves that connect the transmitter to the receiver. These means can be physical media, such as (2) _____ or radio (3) _____ which are transmitted by air. Different kind of cables can be used. The simplest communication cables consist of a single pair of (4) _____ twisted together. Other types are (5) _____ cables and optical (6) _____. Radio waves need (7) _____ to be transmitted and sometimes (8) _____ are necessary for long- distance transmission.

Exercise 6. Read the texts about the different network topologies and fill in the gaps with the words in the box.

nodes circle network pathway affect configure small destination star failure exchanging backbone

NETWORK TOPOLOGIES

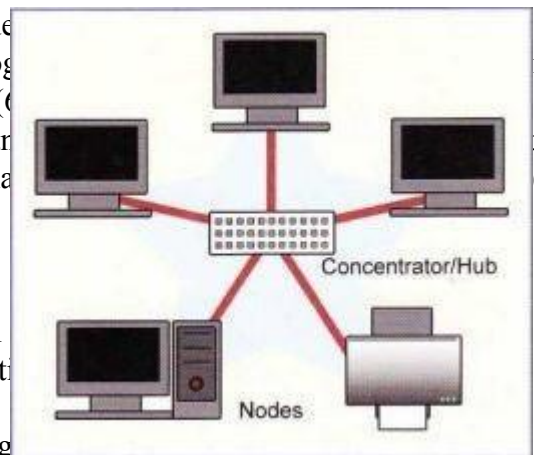
A network topology is the layout of the interconnections of the nodes of a computer network. It depends on the distance involved, the type of hardware used and the stability needed.

Bus network

In a bus network all (1) _are connected to a common medium, called backbone, as it happens with Christmas lights. Information sent along the (2) _travels until the destination is reached. This kind of topology is generally used only for (3) _____ networks, as it isn't able to connect a large number of computers. The main advantage offered by this topology is that if a computer or device doesn't work, it doesn't (4) _ the others.

Star network

In a star network all nodes are connected to a special central node called the hub. Once it has received a signal, the hub passes it to all the other nodes. This means that all the computers and devices are joined together. This topology is used in businesses because it can grant rapidity and safety in (6) _____. Thanks to this topology, data is always up-to-date and (7) _____. It doesn't affect the others. The only disadvantage to it is that if the hub doesn't work, the whole network doesn't work.



Ring network

In a ring network each node is connected to its left and right neighbors. All the data, and communication is sent in one direction. This topology provides only one (9) _____ among the nodes, a single path. If one node is attached to the ring, the whole network is affected.

Star bus topology

Star bus topology is the most common network topology used today. It combines elements of star and bus topologies to create a more effective network. Computers in a specific area are connected to hubs creating a (11) _____, then each hub is connected together along the network backbone.

The main advantage of this type of topology is that it can be more easily expanded over time than a bus or a star. On the other hand, this topology is more difficult to (12) _____ than the others and if the backbone line breaks, the whole network goes down.

Exercise 7. Read the texts again and decide if the following statements are true (T) or false (F), then correct the false ones.

The topology chosen depends only on the location of computers.

All topologies use many cables and are very expensive.

In a bus topology all the buses are connected one after the other.

In a bus topology a server controls the flow of data.

In a star network data is always updated.

The hub doesn't connect printers and other devices in a star topology.

In the ring topology each node is connected to the hub.

In the ring topology if the hub doesn't work, the network goes down.

Star bus topology combines elements of bus and ring topologies.

In a star bus topology a backbone line failure affects the whole network.

Exercise 8. Read the texts again and complete the table with the missing information.

Topology	Connection	Use	Advantages	Disadvantages
		<i>small networks</i>		
	<i>Each node is connected to the central hub</i>			
<i>ring</i>				

Unit 7

Мета заняття: Вміти знаходити необхідну інформацію в технічній літературі, наукових базах даних та інших джерелах інформації, критично оцінювати і аналізувати її.

ENGINEERING AND SCIENCE

Engineering is the application of science to the optimum conversion of the resources of nature to the uses of humankind. The field can be defined as the creative application of “scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behaviour under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property.” The term engineering is sometimes more loosely defined, especially in Great Britain, as the manufacture or assembly of engines, machine tools, and machine parts.

The words engine and ingenious are derived from the same Latin root, *ingenerare*, which means “to create.” The early English verb engine meant “to contrive.” Thus the engines of war were devices such as catapults, floating bridges, and assault towers; their designer was the “engineer,” or military engineer. The counterpart of the military engineer was the civil engineer, who applied essentially the same knowledge and skills to designing buildings, streets, water supplies, sewage systems, and other projects.

The function of the scientist is to know, while that of the engineer is to do. The scientist adds to the store of verified, systematized knowledge of the physical world; the engineer brings this knowledge to bear on practical problems. Engineering is based principally on physics, chemistry, and mathematics and their extensions into materials science, solid and fluid mechanics, thermodynamics, transfer and rate processes, and systems analysis.

Engineers employ two types of natural resources—materials and energy. Materials are useful because of their properties: their strength, ease of fabrication, lightness, or durability; their ability to insulate or conduct; their chemical, electrical, or acoustical properties. Important sources of energy include fossil fuels (coal, petroleum, gas), wind, sunlight, falling water, and nuclear fission. Since most resources are limited, the engineer must concern himself with the continual development of new resources as well as the efficient utilization of existing ones.

Engineering Branches

Engineers apply scientific principles to design or develop structures, equipment, or processes. Engineering encompasses several disciplines. Traditionally, the main branches of engineering are chemical engineering, civil engineering, electrical engineering and mechanical engineering, and they produce chemical, civil, electrical and mechanical technologies, respectively. More specialized branches, such as software engineering and biomedical engineering, also yield corresponding technologies. Note that engineering branches are sometimes defined in terms of technological features (e.g. mechanical engineering), and sometimes in terms of application areas (e.g. environmental engineering). There are many more engineering branches, with more being developed all the time as new technologies develop.

Engineering and the development of new technologies are closely tied to science. We use many technologies in scientific studies, and scientific knowledge helps engineers do their jobs and build new technologies.

Exercise 1. Read and memorize using a dictionary:

application ____

determine

branch

_____ emergence _____ be concerned with _____
 _____ define _____ equipment _____
 _____ invention _____ property

Exercise 2. Answer the questions.

What is engineering?

What sciences is engineering based principally on?

Why must the engineer concern himself with the efficient utilization of resources?

What do engineers apply scientific principles for?

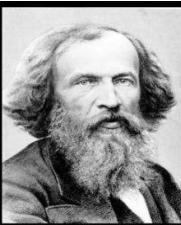
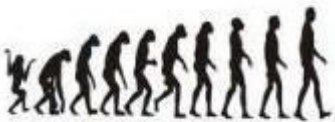
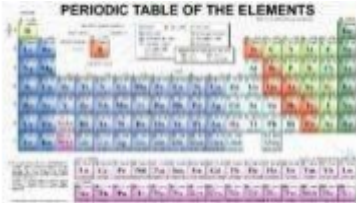
What are the main branches of engineering?

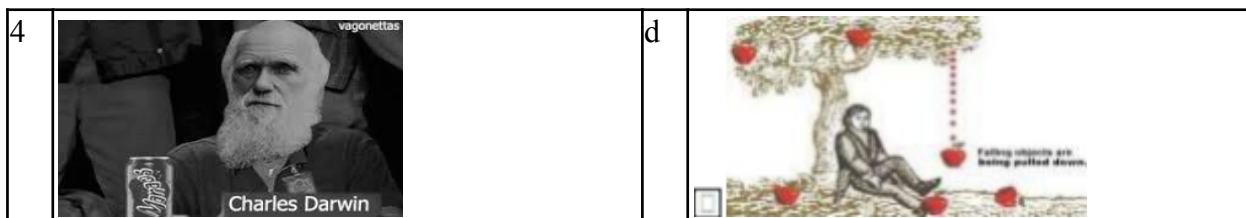
What is engineering closely tied to?

Exercise 3. Read the text about engineering again and match each sentence with its ending.

1	The term engineering is sometimes defined as	a	fossil fuels (coal, petroleum, gas), wind, sunlight, falling water, and nuclear fission.
2	The words engine and ingenious are derived from	b	in terms of technological features (e.g. mechanical engineering).
3	Engineers employ two types of natural resources	c	the manufacture or assembly of engines, machine tools, and machine parts.
4	Important sources of energy include	d	materials and energy.
5	Engineering branches are sometimes defined	e	the same Latin root, <i>ingenerare</i> , which means "to create."

Exercise 4. Match the names of the scientists with their discoveries.

1	 Dmitri Ivanovich Mendeleev Russia 1871	a	
2		b	
3	 INTERESTING FACTS ABOUT MICHAEL FARADAY	c	



Exercise 5. Read the text about science and find synonyms for the words below.

Science is any system of knowledge that is concerned with the physical world and its phenomena and that entails unbiased observations and systematic experimentation. In general, a science involves a pursuit of knowledge covering general truths or the operations of fundamental laws. Physical science is the systematic study of the inorganic world, as distinct from the study of the organic world, which is the province of biological science. Physical science consists of four broad areas: astronomy, physics, chemistry, and the Earth sciences. Each of these is in turn divided into fields and subfields.

On the simplest level, science is knowledge of the world of nature. There are many regularities in nature that humankind has had to recognize for survival since the emergence of *Homo sapiens* as a species. The Sun and the Moon periodically repeat their movements. Some motions, like the daily “motion” of the Sun, are simple to observe, while others, like the annual “motion” of the Sun, are far more difficult. Both motions correlate with important terrestrial events. Day and night provide the basic rhythm of human existence. The seasons determine the migration of animals upon which humans have depended for millennia for survival. With the invention of agriculture, the seasons became even more crucial, for failure to recognize the proper time for planting could lead to starvation. Science defined simply as knowledge of natural processes is universal among humankind, and it has existed since the dawn of human existence.

The history of philosophy is intertwined with the history of the natural sciences. Long before the 19th century, when the term *science* began to be used with its modern meaning, the major figures in the history of Western philosophy were often equally famous for their contributions to “natural philosophy,” the inquiries now designated as sciences. Aristotle (384–322 BCE) was the first great biologist; René Descartes (1596–1650) formulated analytic geometry and discovered the laws of the reflection and refraction of light; Gottfried Wilhelm Leibniz (1646–1716) laid claim to priority in the invention of the calculus; and Immanuel Kant (1724–1804) offered the basis of a hypothesis regarding the formation of the solar system.

The great philosophers also offered accounts of the aims and methods of the sciences. They ranged from Aristotle’s studies in logic through the proposals of Francis Bacon (1561–1626) and Descartes, which shaped 17th-century science. They were joined in these ideas by the most eminent natural scientists. Galileo (1564–1642) supplemented his arguments about the motions of earthly and heavenly bodies with claims about the roles of mathematics and experiment in discovering facts about nature. Similarly, the account given by Isaac Newton (1642–1727) of his system of the natural world is punctuated by a defense of his methods and an outline of a positive program for scientific inquiry. Antoine-Laurent Lavoisier (1743–94), James Clerk Maxwell (1831–79), Charles Darwin (1809–82), and Albert Einstein (1879–1955) all continued this tradition, offering their own insights into the character of the scientific enterprise.

- | | | | | |
|---|---------|----|-----------|-------|
| 1 | involve | 6 | emergence | ___ |
| 2 | pursuit | 7 | inquiry | _____ |
| 3 | general | 8 | outline | _____ |
| 4 | eminent | 9 | insight | _____ |
| 5 | account | 10 | offer | |

Exercise 6. Match the left part with the right:

1. Physical science is	a) hypothesis regarding the formation of the solar system.
2. René Descartes (1596–1650) formulated	b) the motions of earthly and heavenly bodies.
3. Galileo (1564–1642) presented arguments about	c) the systematic study of the inorganic world.
4. Gottfried Wilhelm Leibniz (1646–1716) laid claim to	d) analytic geometry and discovered the laws of the reflection and refraction of light
5. Immanuel Kant (1724–1804) offered the basis of a	e) priority in the invention of the calculus.

Exercise 7. Ask questions to the given answers:

Question: ____ ?

Answer: Physical science consists of four broad areas: astronomy, physics, chemistry, and the Earth sciences.

Question: ____ ?

Answer: Science is any system of knowledge concerned with the physical world and its phenomena.

Question: ? ____

Answer: The history of philosophy is intertwined with the history of the natural sciences.

Question: ? ____

Answer: The term *science* began to be used with its modern meaning in the 19th century.

Question: ? ____

Answer: The major figures in the history of Western philosophy were equally famous for their contributions to “natural philosophy”.

Exercise 8. Decide if the following statements are true (T) or false (F), then correct the false ones. Engineering is the application of science to the optimum conversion of the resources of nature to the uses of humankind.

Engineering cannot be defined as the creative application of “scientific principles to design or develop structures, machines, apparatus.

Engineers employ one type of natural resources: energy.

Engineering branches are never defined in terms of technological features. _____

5. Science involves a pursuit of knowledge covering general truths or the operations of fundamental laws. _____

6. Day and night provide the basic rhythm of human existence. _____

7. Science has existed since the beginning of the 18th century. _____

8. Aristotle (384–322 BCE) was the first great composer. _____

Unit 8

Мета заняття: Вміти знаходити необхідну інформацію в технічній літературі, наукових базах даних та інших джерелах інформації, критично оцінювати і аналізувати її.

METAL PROCESSES AND MATERIALS

Casting is a 6,000-year-old process. It is the oldest and most well-known technique based on three fundamental steps: moulding, melting and casting. First the pattern is made to form the mould. Then an empty mould is created, and finally the empty cavity is filled with molten metal which is then left to solidify into the shape. Casting materials are usually metals but can also be plastic, resin or various cold materials for example concrete. Casting is usually used for making complex shapes.

Drawing is a manufacturing process for producing wires, bars and tubes by pulling on material through a series of dies until it increases in length. It is divided into two types: sheet metal drawing, and wire, bar and tube drawing. Drawing is usually done at room temperature but it can be performed at elevated temperatures to hot work large wires, rods or hollow sections in order to reduce forces

Forging is the process by which metal is heated and shaped by a compressive force using a hammer or a press. It is used to produce large quantities of identical parts, such as machine parts in the automobile industry. Cold forging is done at a low temperature using soft metals and plastic. Hot forging is done at a high temperature and makes metal easier to shape without breaking. In the past, forging was done by a blacksmith using a hammer. Nowadays industrial forging is done with presses powered by a machine.

Rolling is a metal forming process in which a material (metal, plastic, paper or glass) is passed through a pair of rollers. According to the type of material rolled, there is hot rolling or cold rolling.

Extrusion is a process used to produce objects with a fixed cross-sectional profile. A material is pushed or drawn through a die of the desired cross-section. The two main advantages of this process are its ability to create very complex cross-sections and work materials that are brittle. The extrusion process can be done with hot or cold materials. Commonly extruded materials include metals, polymers, ceramics, concrete and foodstuffs. Ceramic can also be formed into shapes via extrusion. Terracotta extrusion is used to produce pipes. Many modern bricks are also manufactured using a brick extrusion process. Extrusion is also used in food processing.

Products such as certain pastas, many breakfast cereals, French fries, dry pet food and ready-to-eat snacks are mostly manufactured by extrusion.

Sheet metal forming is simply metal formed into thin and flat pieces. The basic forms can be cut and bent into a variety of different shapes. Everyday objects are constructed with this process. There are many different metals that can be made into sheet metal, such as aluminium, brass, copper, steel, tin, nickel and titanium. For decorative uses, important sheet metals include silver, gold, and platinum. Sheet metal forming is used in car bodies, airplane wings and roofs for buildings.

Exercise 1. Read and memorize using a dictionary:

alloy _	die ____	rod ____
bar ____	extrusion	rolling
bent	flat ____	rubber
blacksmith	hammer	shape
brick	hollow	sheet
brittle	insulate	tin ____
casting	mould	tool ____
concrete _ oxidize _ tube	copper _ pipe _ wire	—

Exercise 2. Put the words in the correct order to make complete sentences. taking their forms / fluid substances / into moulds / _ solidify

drawing / room temperature / is done at

not essential / heat / is / in the drawing process

in the past / using / forging / a hammer / was done can be _____
/ brittle materials / extrusion / done / with

many / is used / everyday objects / sheet forming / to make

Exercise 3. Read the texts again and answer the following questions.

Which steps are included in casting?

What is the mould used for?

What does drawing use in order to process metals?

What types of drawing are there?

What kind of process is forging?

How was forging done in the past?

What does rolling consist of?

What materials can be used in rolling?

What are the advantages of extrusion?

What materials can be used in extrusion?

What kind of process is sheet metal forming?

What can vary in sheet metal forming?

Exercise 4. Using the following words complete the texts about materials: *properties, pure, tools, reinforced, insulate, ceramics, aircraft, pasty, alloy, non-ferrous*.

Materials

A mechanical engineer uses different materials to build machinery or 1)_. A specific knowledge of materials is required, concerning qualities, 2)_, costs and general characteristics.

When a machine or a tool is made, the most suitable material must be chosen by considering its properties, which can be classified as mechanical, thermal, electrical and chemical. The main types of materials used in mechanical engineering are metals, polymer materials, 3)_ and composite materials.

The most commonly used materials are metals, which can be divided into ferrous and non-ferrous. They can be used in their 4)_ form or mixed with other elements. In this second case we have an 5)_ and it is used to improve some properties of the metals. The most commonly used ferrous metals are iron and alloys which use iron. Because iron is soft and ___it is not suitable to be used as a structural material, so a small amount of carbon is added to it to make steel alloy.

Non-ferrous metals contain little or no iron. The most common 7)_ metals used in mechanics are copper, zinc, tin and aluminium. Some common non-ferrous alloys are brass (formed by mixing copper and zinc), bronze (formed by mixing copper and tin) and other aluminium alloys which are used in the 8)_ industry. Other examples of materials used in mechanical engineering are plastic and rubber.

PVC or polyvinyl chloride is a type of plastic and is used to 9)_ wires and cables. Rubber is a polymer and its best property is elasticity, as it returns to its original size and shape after deformation. Ceramic materials are good insulators: hard, resistant and strong, but brittle. Composite materials are made up of two or more materials combined to improve their

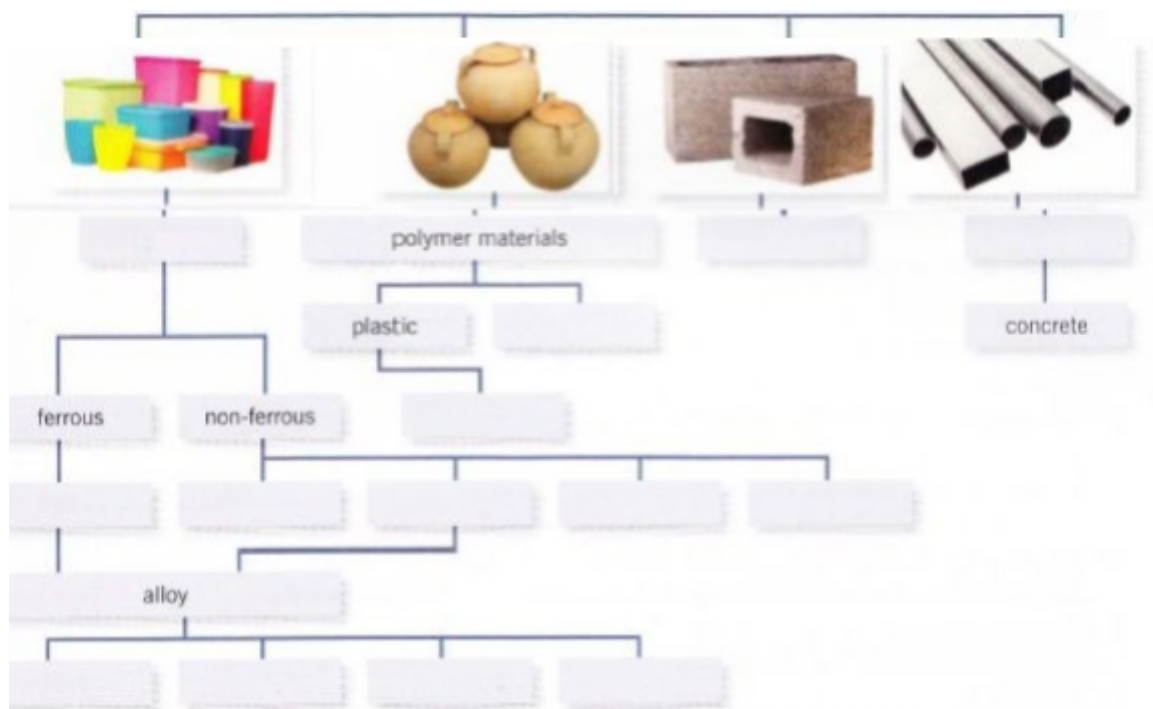
mechanical properties. Concrete is 10) _____ with steel and is used in building engineering.

Exercise 5. Match the words with their definitions.

1 alloy	a a type of plastic used for insulation
2 steel	b a combination of different metals
3 PVC	c an alloy formed by mixing iron and carbon
4 concrete	d an alloy formed by mixing copper and zinc
5 brass	e metals containing iron
6 ferrous materials	f a composite material used to build houses
7 ceramic	g a metal not suitable as structural material
8 iron	h a good insulator but brittle

Exercise 6. Complete the following diagram.

MATERIALS



Exercise 7. Complete the definitions with the words in the box.

cooking coins alloy air copper wires steel carbon gold ferrum
expensive ductile

Iron: Its Latin name is (1) _____. It is magnetic and has a silvery colour. In prehistoric times it was used to make ornaments and weapons. If exposed to the (2) _____, it oxidises.

(3) _: It is one of the most widely used metals by humans. In prehistoric times it was used to make cooking utensils, (4) _and ornamental objects. It is used in (5) _and cables.

(6) ____: It is the most (7) ____metal.

(9) ____: It is an (10) _formed from iron and (11) ____.

It can contain between 2,1% and 4 % carbon. It is also used for (12) _____ utensils and pans.

Unit 9

Мета заняття: Знати і розуміти інженерні науки, що лежать в основі спеціальності «Теплоенергетика» відповідної спеціалізації, на рівні, необхідному для досягнення інших результатів освітньої програми, в тому числі певна обізнаність в останніх досягненнях науки і техніки у сфері теплоенергетики.

TECHNICAL DRAWING and CAD/CAM SYSTEMS

Technical drawing, also known as drafting, is the act and discipline of composing plans. The main purpose of technical drawing is to describe or explain all the characteristics of a product, giving all the necessary information that will help a manufacturer to produce that component. The visual image should be accurate in terms of dimensions and proportions, and should provide an overall impression of what an object is or does. It is a precise task requiring a high level of skill and suitable engineering tools. A drafter is the person who makes a drawing and who requires a wide knowledge of geometry, trigonometry and spatial comprehension, and in all cases must be precise and accurate and give great attention to details. People who communicate with technical drawings use a visual language and technical standards that define practical symbols, perspectives and units of measurement. What are the tools and instruments used by a drafter in manual drafting? They are: a T-square, a protractor, a compass, rulers, and triangles. Paper is also important and can be divided into layout paper, which is thin and fragile, and cartridge paper, which is heavier and more suitable for final drawings. Pencils used in drawing are graded from H to F depending on the hardness. The final drawing is made using a technical pen, graded according to the point, which must maintain the same line width. They are used with a range of stencils to add symbols, letters and patterns to the drawing. Rubbers remove pencils or pen writing when mistakes are found.

Correction fluid is used to mask text errors.

Drawing boards and manual drawing are not always precise and rapid: traditional design is usually slow, especially in its revision and modification. For this reason manufacturing firms have replaced manual drawing with computer-aided design (CAD) to carry out functions related to design and production. This computer technology assists the designer in the creation, modification and analysis of a physical object. Nowadays computer software can easily provide a three-dimensional drawing, which allows engineering designers to see how mechanical components may fit together without making models thus saving a lot of time. CAD is much faster and more accurate than manual drawing; designs can be quickly modified, reproduced and transmitted electronically. Computer simulated analysis of the model helps experts find problems and defects without building prototypes, in this way saving a lot of money and time. When the design is ready, the CAD system can generate the detailed drawings needed to start product manufacturing. When CAD systems are linked to manufacturing equipment controlled by computers, they form an integrated CAD/CAM system. Computer-aided manufacturing (CAM) offers significant advantages, over traditional approaches by controlling manufacturing equipment with computers instead of human labour. CAM converts the design of a component into computer language and it gives instructions to the computer regarding operations. Thanks to CAD/CAM systems it is possible to eliminate operator errors and reduce manufacturing costs.

Exercise 1. Read and memorize using a dictionary.

carry out _____	ruler _____	drafter _____
skill _____	drafting _____	technical drawing _____
_____ save	hardness _____	fit _____
	T-square _____	triangle _____
	protractor _____	point _____
		width _____

_____ to replace _____

Exercise 2. Match the words with their definitions

1 protractor	a) a thin sheet of card, plastic, or metal with a pattern or letters cut out of it, used to produce the cut design on the surface below
2 ruler	b) an instrument for drawing circles and arcs and measuring distances between points, consisting of two arms linked by a movable joint, one arm ending in a point and the other usually carrying a pencil or pen
3 compass	c) a tough elastic polymeric substance made from the latex of a tropical plant or synthetically and used for erasing pencil or ink marks
4 rubber	d) a straight strip or cylinder of plastic, wood, metal, or other rigid material, typically marked at regular intervals and used to draw straight lines or measure distances
5 triangle	e) a flat, semi-circular piece of plastic or metal which is used for measuring angles
6 T-square	f) a measure of how resistant solid matter is to various kinds of permanent shape change when a compressive force is applied
7 stencil	g) T-shaped instrument for drawing or testing right angles
8 hardness	h) an object, arrangement, or flat shape with three straight sides and three angles

Exercise 3. Find antonyms in the text for the words

below: accurate _____ 5 suitable _____ high

6 manual _____ wide _____ 7 thin

heavy _____ 8 fragile _____

Exercise 4. Choose the correct answer.

Technical drawing is needed to...

A make a scale of the product.

B practise pens, rulers and stencils.

C let the manufacturer understand the requirements The drafter needs...

A some paper and a pencil.

B a wide range of technical instruments.

C the final product.

Paper is chosen considering...

what sort of drawing the drafter is going to make.

the pencils he/she is going to use.

the drafter's preference.

Pencils are graded according to...

A hardness.

B hardness and colour.

C hardness and point A technical pen...

- A makes regular lines.
 - B maintains the same line width.
 - C draws lines of the same length.
- When mistakes are found...
- A we can't correct them.
 - B they're removed with correction fluid.
 - C stencil can cover them.

Exercise 5. Answer the following questions:

Why have manufacturing firms replaced manual drawing with computer-aided design to carry out functions related to design and production?

What does a three-dimensional drawing allow engineering designers to see?

What can the CAD system generate when the design is ready?

How does computer simulated analysis of the model help experts find problems? What does computer-aided manufacturing offer?

What does CAM convert the design of a component into?

Exercise 6. Match each sentence with its ending.

CAD helps designers a) seen from any angle and are easily manipulated By using a CAD technology b) to draw, modify and correct designs.

Unlike manual drawing, CAD c) the design into computer language.

CAD allows us to save d) defects can be easily found.

CAD designs can be e) provides three-dimensional drawings.

CAM is the use of computer software f) time and money

The CAM system turns g) minimise errors and manufacturing costs.

CAD/CAM systems h) to control machine tools in the manufacturing process

Exercise 7. Ask questions to the given answers:

Question: ?

Answer: CAD assists the designer in the creation, modification and analysis of a physical object. Question: ?

Answer: When CAD systems are linked to manufacturing equipment controlled by computers, they form an integrated CAD/CAM systems.

Question: ?

Answer: Thanks to CAD/CAM systems it is possible to eliminate operator errors and reduce manufacturing costs.

Unit 10

Мета заняття: Вміти знаходити необхідну інформацію в технічній літературі, наукових базах даних та інших джерелах інформації, критично оцінювати і аналізувати її.

MACHINE TOOLS

A machine tool uses a power source to modify the shape of metal components of machines. It is used as a tool in the making of other machines.

Machine tools were powered in the Middle Ages by humans and animals, and later by the energy captured by waterwheels. After the Industrial Revolution, most machine tools were powered by steam engine and nowadays by electricity.

Machine tools can be operated manually, or under automatic control. In the 1960s, computers gave more flexibility to the process. Such machines became known as computerized numerical control (CNC) machines. They could precisely repeat sequences, and could produce much more complex pieces than even the most skilled tool operators.

Let's examine the main features of some of the most commonly used machine tools.

Turning machine. The engine lathe is the most important of all the machine tools. It is used to produce external or internal cylindrical surfaces. The piece is held by the machine and is rotated while a cutting tool removes excess metal from the external diameter. Internal turning consists of enlarging and finishing a hole.

Shaper. This is a metal-cutting machine used to produce or modify flat surfaces. The cutting tool moves cutting on the forward stroke, with the piece feeding automatically towards the tool during each return stroke. Shapers can be horizontal or vertical.

Drilling machine. It is used to produce circular holes in metal with a twist drill. It also uses a variety of other cutting tools to perform the basic hole-machining operations.

Milling machine. This cuts flat metal surfaces. The piece is fed against a rotating cutting tool. Cutters of many shapes and sizes are available for a wide variety of milling operations. Milling machines may be manually operated, mechanically automated, or digitally automated via computer numerical control (CNC).

Grinding machine. This removes excessive material from parts that are brought into contact with a rotating abrasive wheel. Grinding is the most accurate of all the basic machining processes, but also the most time consuming.

Press. This is a machine tool that changes the shape of a workpiece. Historically, metal was shaped by hand using a hammer. Machine presses can be dangerous. Bi-manual controls (controls which require both hands to be on the buttons to operate) are a very good way to prevent accidents.

Band saw. It is a power tool which uses a blade consisting of a continuous band of metal with teeth along one edge. The band usually rides on two wheels rotating in the same plane. Band saws are used for woodworking, metalworking, and are particularly useful for cutting irregular or curved shapes. A constant flow of liquid is poured over the blade to keep it cool and preventing it from overheating.

Exercise 1. Read and memorize using a dictionary.

band saw _ shaper _ blade _ skilled _ drilling machine _ steam engine _ feature _ stroke
grinding machine _
surface _ lathe _ turning machine _
overheating _ waterwheel _

Exercise 2. Read the text about metalworking processes and complete the table.

Machine Tool	Final result	Description
<i>turning machine</i>	external and internal surface and flat	It removes excess metal from the external diameter. It enlarges and finishes a hole.
	specific shape	It cuts flat metal surfaces.
	holes	It uses a twist drill to make holes.
	flat surface	It cuts the piece.
	specific shape	It changes the shape of a workpiece.
	cut pieces	It cuts various parts using a continuous band of metal with teeth.
	finishing	It removes excessive material from parts.

Exercise 3. Decide if the following sentences are true (T) or false (F).

Turning machines remove excess metal from the external diameter and enlarge _____ and finish a hole.

Shapers can only be vertical.

Drilling machines use a twist drill to make circular holes.

Milling machines can only be manually operated.

Grinding machines remove excessive material from parts.

Band saws use a band of metal with teeth to cut various parts.

Presses are not dangerous if operated by both hands.

Exercise 4. Read the text about CNC and put the sentences in the correct order.

Computer Numerical control (CNC) refers to the automation of machine tools in manufacturing processes. The machines are controlled by computer software which carries out a series of operations automatically. The first NC machines were built in the 1940s and 1950s. They are used to cut and shape products, such as automobile parts that need precise specifications. Parts must be carefully planned and prepared by CNC programmers. First they view the three-dimensional computer aided designed part. Then they calculate where to cut, the speed and shape and select the tools and materials. The CNC programmers translate the planned machine operations into a set of instructions. These instructions are translated into a computer aided manufacturing (CAM) program containing a set of commands for the machine.

The commands are a series of numbers which explains where to cut and the position of material.

The computer checks all the operations made by the machine tools.

The planned machine operations are translated into a set of instructions.

These instructions are translated into a CAM program.

The program contains a set of commands for the machine.

It is calculated where to cut and tools and materials are selected.

The computer checks all the operations made by the machine tools.

Programmers view the part in its three-dimensional computer aided design.

Exercise 5. Ask questions to the given answers:

Question: ____ ?

Answer: Computer Numerical control (CNC) refers to the automation of machine tools in manufacturing processes.

Question: ____ ? Answer: The first NC machines were built in the 1940s and 1950s.

Question: ____ ? Answer: The computer checks all the operations made by the machine tools.

Exercise 6. Give the words that have similar meanings (synonyms):

- | | | | |
|---|--------------|---|-------------------|
| 1 | shape _ | 5 | perform _____ |
| 2 | power _ | 6 | enlarge _____ |
| 3 | feature ____ | 7 | precisely _____ |
| 4 | size _____ | 8 | particularly ____ |

Exercise 7. Read the texts again and write a list of all the machine tools mentioned.

Exercise 8. Pick out all international words from the text on CNC machines.

Unit 11

Мета заняття: Вміти знаходити необхідну інформацію в технічній літературі, наукових базах даних та інших джерелах інформації, критично оцінювати і аналізувати її.

TECHNICAL ASSISTANCE

Any machine and device must be controlled regularly in order to avoid the risk of damage or breakdown of single parts due to long usage. Sometimes, if a proper maintenance is not done, a fault could occur, with negative consequences on the production process and on the workers' safety. The primary goal of maintenance is to avoid or mitigate the consequences of failure of equipment. This includes performing routine actions to keep the device in working order and prevent the failure before it actually occurs (preventive maintenance), or fixing equipment after breakdown (corrective maintenance).

Preventive maintenance is designed to preserve and restore equipment reliability by replacing worn components before they actually fail. It includes maintenance activities such as partial or complete overhauls at specified periods, oil changes and lubrication. The ideal preventive maintenance is a combination of technical, administrative and managerial actions to prevent all equipment failure. If carried out properly, preventive maintenance can extend the life of the equipment.

Corrective maintenance, sometimes simply called 'repair', is carried out to get equipment working again. It aims at restoring the functionality of a machine so that it can continue to perform its work. This type of maintenance can be very expensive because sometimes equipment needs to be replaced, with substantial costs for the company.

Generally, maintenance is scheduled according to:

the original equipment manufacturer's recommendations;
codes and legislation within a
country; consultancy advice; previous
maintenance;

most important measured values and performance indications.

Auto maintenance describes the act of inspecting or testing the condition of car subsystems (e.g.: engine, brakes, radiator, etc.) and replacing parts and fluids. Thanks to regular maintenance it is possible to ensure the safety, reliability and comfort of a car, while during preventive maintenance, a number of parts are replaced to avoid major damage or for safety reasons. Car maintenance is usually scheduled according to different factors, such as the year or model of the car, its driving condition and driver behaviour. When scheduling auto maintenance, car manufacturers recommend keeping in mind some factors that may affect the functionality of car subsystems. Some of these factors are: the number of trips and the distance travelled every day; the exposure to particular climate conditions (extreme hot or cold); long-distance cruising and whether the car has to tow a trailer or other heavy loads.

Common car maintenance tasks include:

car wash
check or replace the engine oil and oil
filters inspect or replace windshield wipers
inspect tyre pressure and wear check wheel
alignment
check, clean or replace battery terminals
inspect or replace brake pads and fluids

inspect or replace air filter
 lubricate locks and hinges
 check all lights
 inspect or replace spark plugs
 tighten chassis bolts

Some tasks that have equivalent service intervals can be combined into one single service known as a tune-up. In modern cars, where electronics controls most of the car's functions, the traditional tune-up has been replaced by incorporated software that takes care of the engine by constantly checking thousands of sensor signals. Completed maintenance services are then recorded in a service book which is very useful for keeping track of the car service history.

Exercise 1. Read and memorize using a dictionary.

alignment _____ lubrication _____
 bolt _____ overhaul _____ break _____
 schedule _____ break pad _____
 spare wheel _____ chassis _____ steering wheel
 _____ entail _____ tighten _____
 exposure _____ tow _____ failure _____
 trunk _____ foul _____ trailer _____ hinge _____
 tyre _____ lock _____ windshield _____

Exercise 2. Answer the questions.

Why is maintenance important?

What are the main types of maintenance?

What is the function of preventive maintenance?

Which activities does it include?

What is maintenance called if it occurs after a failure?

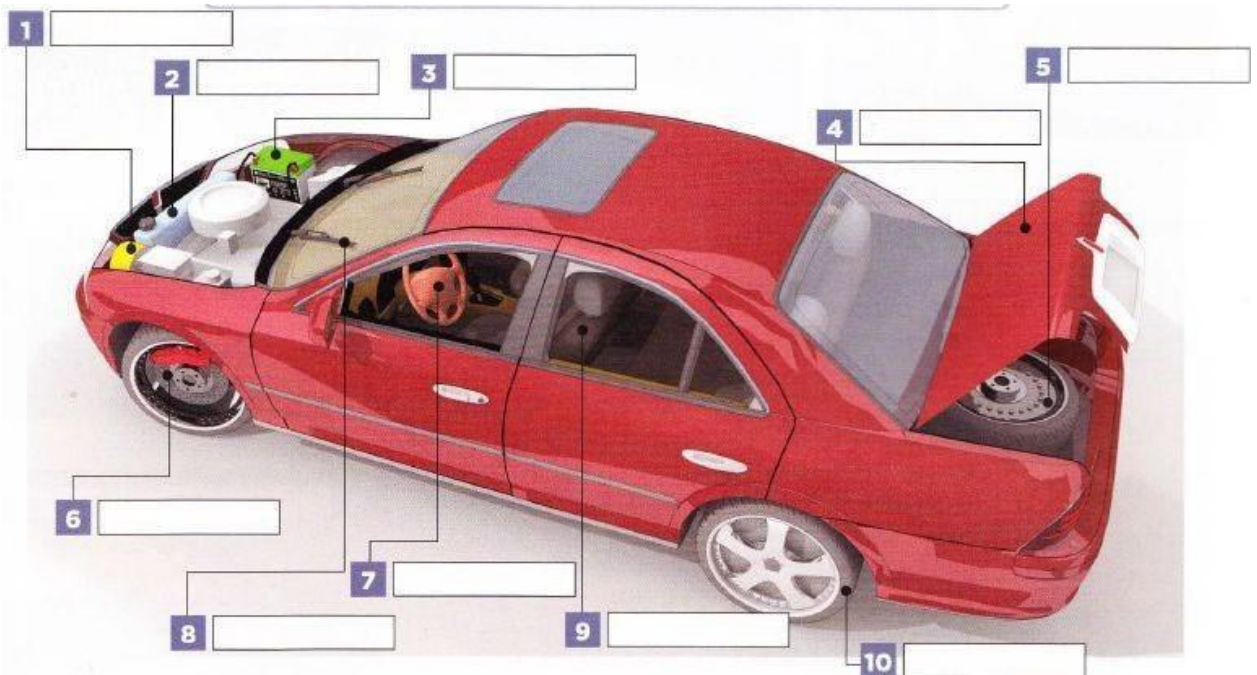
Why can corrective maintenance be expensive?

Exercise 3. Match the words with their definitions.

- | | | | |
|---|-------------|---|---|
| 1 | fault | a | damaged and in poor condition as a result of much use |
| 2 | to mitigate | b | a set of rules about how something must be done |
| 3 | to fix | c | expert advice within a particular field |
| 4 | overhaul | d | applying a greasy substance to reduce friction |
| 5 | worn | e | a break or other defect in a piece of machinery |
| 6 | lubrication | f | to do the necessary work to repair something that doesn't work properly |
| 7 | code | g | to make something less severe or unpleasant |
| 8 | consultancy | h | a careful examination of a machinery or system that must be repaired |

Exercise 4. How well do you know the components of a car? Look at the picture and label each part with the words in the box.

seat battery radiator tyre spare wheel steering wheel disk brake
oil filter trunk windshield wiper



Exercise 5. Decide if the following rules are true (T) or false (F), then correct the false ones.

Cars are not just a luxury item to purchase one day and forget about until something happens. A properly maintained car not only lasts longer, but it is also less likely to break down unexpectedly.

Auto maintenance doesn't entail replacing fluid. True/False

It is not possible to do preventive maintenance to cars. True/False

Car maintenance must be scheduled keeping in mind different factors. True/False

The distance travelled every day doesn't affect the functionality of a car. True/False

If a car is exposed to extreme weather conditions, it must be checked more often. True/False

It is not possible to replace windshield wipers. True/False

Brake fluid lasts forever. True/False

Car maintenance tasks should never be combined in one single service. True/False

Exercise 6. Read the dialogue between Mrs. Farrell and her mechanic and complete it with the following words: *service book, start, filters, help, tune-up, good condition, engine oil, inspect, tested, replace.*

Mechanic: Good afternoon, Mrs. Farrell.

Mrs. Farrell: Good afternoon, John. How are you?

Mechanic: I'm fine, thank you. How can I (1) _____ you?

Mrs. Farrell: Well, I need a complete (2) ____ for my car. Next week my husband and I are going on holiday by car. It's going to be a long journey all the way to Spain and I want my car to be in (3) ____.

Mechanic: Sure. No problem. Have you checked your car recently?

Mrs. Farrell: Let me think ... It must have been last year, in June, when the car wouldn't (4) __. Anyway, it should all be written in the (5) __. It's in the glove compartment.

Mechanic: OK, I'll take it. Let's see ... Oh, yes, it was the battery and I changed it. Are there any problems at the moment?

Mrs. Farrell: Not really, but I think the (6) __ needs to be replaced.

Mechanic: Sure. I'll check the filters too.

Mrs. Farrell: Yes, I think it's a good idea. Could you (7) ____ the tyres as well? And maybe wash it; it's so dirty. Well, John, when do you think the car will be ready?

Mechanic: Actually, I'm quite busy at the moment, Mrs. Farrell, so I could give it back to you next Friday. Would that be convenient for you?

Mrs. Farrell: Yes, it'd be perfect, because we're leaving on Sunday. I'll call you on Tuesday for a confirmation then.

Mechanic: All right. Goodbye, Mrs. Farrell.
on Friday...

Mechanic: Good morning, Mrs. Farrell. Here are your keys. I replaced the engine oil and the (8) _____. Then I checked the tyres and the brakes too. I had to (9) __ the spark plugs because they were fouled. I also (10) _____ the electronics and then I washed the car. Now everything is OK, you can set off with no worries.

Mrs. Farrell: That's great! Thank you very much, John.

Exercise 7. Read the dialogue again and answer the questions.

What does Mrs. Farrell want?

Why does she need a complete tune-up?

What is written in the service book?

What does the car need to be done?

When will the car be ready?

What did John replace in the car?

Unit 12

Мета заняття: Знати і розуміти інженерні науки, що лежать в основі спеціальності «Теплоенергетика» відповідної спеціалізації, на рівні, необхідному для досягнення інших результатів освітньої програми, в тому числі певна обізнаність в останніх досягненнях науки і техніки у сфері теплоенергетики.

WHAT IS ELECTRICITY?

The ancient Greeks noticed that when they rubbed a piece of amber with wool or fur, the amber attracted or picked up small pieces of leaves or dust. This was called the amber effect. The English word electricity comes from the Greek word electron, which means amber.

In the eighteenth century, scientists discovered that there are two types of electric charge. The American Benjamin Franklin named these charges positive and negative. It was noted that like charges repel each other and unlike charges attract each other.

A spectacular example of this phenomenon occurs during a storm. Inside a cloud, currents of air rub against the raindrops. As the electrons are rubbed off, one cloud becomes positively charged and another negatively charged. The opposite charges attract each other, and an enormous spark of electricity jumps from one cloud to another or from a cloud to the ground. Thus, lightning is produced.

All substances, solids, liquids or gases, are composed of one or more of the chemical elements. Each element is composed of identical atoms. Each atom is composed of a small central nucleus consisting of protons and neutrons around which orbit shells of electrons. These electrons are very much smaller than protons and neutrons. The electrons in the outermost shell are called valence electrons and the electrical properties of the substance depend on the number of these electrons. Neutrons have no electric charge, but protons have a positive charge while electrons have a negative charge. In some substances, usually metals, the valence electrons are free to move from one atom to another and this is what constitutes an electric current. Electricity consists of a flow of free electrons along a conductor. To produce this current flow, a generator is placed at the end of the conductor in order to move the charge.

Electricity needs a material which allows a current to pass through easily, which offers little resistance to the flow and is full of free electrons. This material is called a conductor and can be in the form of a bar, tube or sheet. The most commonly used conductors are wires, available in many sizes and thicknesses. They are coated with insulating materials such as plastic.

Semiconductors such as silicon and germanium are used in transistors and their conductivity is halfway in between a conductor and an insulator. Small quantities of other substances, called impurities, are introduced in the material to reduce the conductivity. A material which contains very few electrons is called an insulator. Glass, rubber, dry wood and plastic resist the flow of electric charge, and as such they are good insulating materials.

Exercise 1. Read and memorize using a dictionary.

charge	_____	_____	_____	_____	_____
to pass through	_____	coated	_____	property	conductor
semiconductor	_____				
current flow	_____	shell	_____	halfway	_____
impurity	_____	_____	_____	to switch off	steady

insulator _____ thickness _____ to orbit _____
 valence _____

Exercise 2. Read the text again and complete the sentences with the missing information.

Elements make up _____ Identical

atoms _____

Atoms consist of _____ and _____

Inside there are _____ and _____, while outside _____

Shells

Valence electrons _____

Neutrons do not have

Electricity is generated when

Exercise 3. Decide if the following statements are true (T) or false (F), then correct the false ones. A flow of electrons moving inside a conductor creates an electric current. A generator is used to move the charges.

Electrons can easily pass through any material.

Any material is a good conductor.

Conductors are coated with insulators.

The presence of free electrons affects the conductivity of materials.

Impurities are introduced to increase conductivity.

Insulating materials resist the flow of electrons.

Exercise 4. Using the following words complete the text: *wire, current, rate, difference, quantity, direction, voltage, power.*

There are two types of current: Direct current (DC) and Alternating current (AC). Direct current is a continuous flow of electrons in one 1) _____ and it never changes its direction until the 2) _____ is stopped or switched off.

Alternating current constantly changes its direction because of the way it is generated. The term 'frequency' is used to indicate how many times the 3) _____ changes its direction in one second.

Alternating current has a great advantage over direct current because it can be transmitted over very long distances through small wires, by making energy high 4) _____ and low current.

There are several quantities that are important when we are talking about electric current. Volts (V) - so named after the Italian physicist Alessandro Volta - measure the 5) _____ of electric potential between two points on a conducting

6) _____. Amperes (A) measure the amount of current flowing through a conductor, that is to say the number of electrons passing a point in a conductor in one second. Coulomb (C) measure the

7) _____ of charge transferred in one second by a steady current of one ampere. Power is the 8) _____ at which work is performed and it is measured in watts (W). A Kilowatt (kW), which is equal to one thousand watts, is used to measure the amount of used or available energy. The amount of electrical energy consumed in one hour at the constant rate of one kilowatt is called kilowatt-hour.

Exercise 5. Read the text again and complete the table with the missing information.

Unit of measurement	What does it measure?
---------------------	-----------------------

1	the number of electrons passing a given point in a conductor in one second
2	the quantity of electricity transferred by a steady current of one ampere
3	the amount of electric energy used
4	the difference of potential between two points on a conductor
5	rate at which work is done

Exercise 6. Ask questions to the given answers:

Question: ?

Answer: Alternating current constantly changes its direction because of the way it is generated.

Question: ?

Answer: Volts measure the difference of electric potential between two points on a conducting wire.

Question: ?

Answer: Power is the rate at which work is performed and it is measured in watts.

Question: ?

Answer: The term 'frequency' is used to indicate how many times the current changes its direction in one second.

Exercise 7. Match the words with their definitions:

1 shell	a) the rate at which something occurs over a particular period of time or in a given sample
2 resistance	b) a substance or device that does not readily conduct electricity
3 impurity	c) relating to or denoting electrons involved in or available for chemical bond formation
4 insulator	d) a trace element deliberately added to a semiconductor; a dopant
5 frequency	e) each of a set of orbitals around the nucleus of an atom, occupied or able to be occupied by electrons of similar energies
6 nucleus	f) the ability of a substance or an electrical circuit to stop the flow of an electrical current through it
7 charge	g) the positively charged central core of an atom that contains most of its mass
8 valence	h) energy stored chemically for conversion into electricity

Unit 13

Мета заняття: Знати і розуміти інженерні науки, що лежать в основі спеціальності «Теплоенергетика» відповідної спеціалізації, на рівні, необхідному для досягнення інших

ELECTRIC CIRCUITS

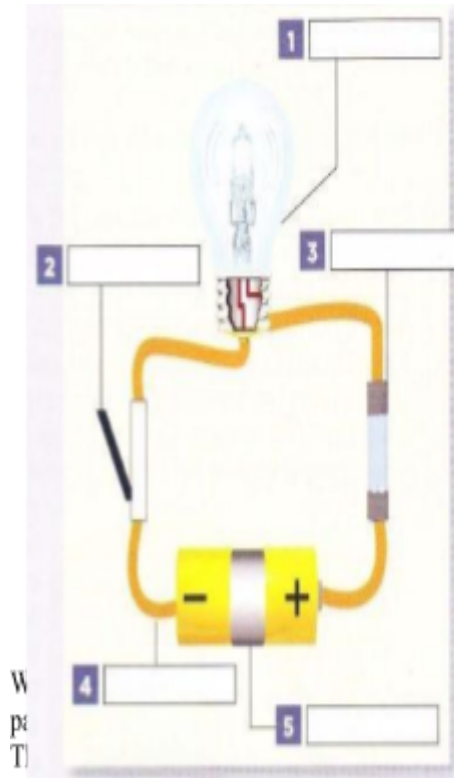
An electric circuit or network is a pathway through which the electric current can flow. A simple circuit consists of a power source, two conducting wires, each one attached to a terminal of the source and a device through which electricity can flow. This device is called a load and it's attached to the wires. If all the parts are properly connected, the current flows and the lamp lights up. This kind of circuit is called 'closed'.

On the contrary, if the wires are disconnected the circuit is called 'open' or 'broken'. The circuit can be opened and closed by a device called a switch.

Loads can turn electrical energy into a more useful form. Some examples are: light bulbs, which change electrical energy into light energy;

electric motors, which change electrical energy into mechanical energy; speakers,

which change energy into sound. The source provides the electrical energy used by the load. It can be a storage battery or prevent short circuits, it is best to use fuses, a generator. The switch interrupts the which melt when too much current flows through current delivered to the load by the source them, interrupting in this way the circuit. and allows us to control the flow.



resistance or a broken insulation. In order to

The standard return for electrical and electronic circuits is the earth ground. When an electrical or electronic device fails, it may open the return circuit to the earth ground. The user of the device could become a part of the device's electrical circuit by providing a return path for the electrons through the user's body instead of the circuit's earth ground. When our body becomes part of an electrical circuit, the user can be seriously shocked, or even killed by electrocution.

To prevent the danger of electrical shock and the possibility of electrocution, ground fault interrupt devices detect open circuits to earth ground in attached electrical or electronic devices. When an open circuit to earth ground is detected, the GFI (ground-fault-interrupt) device immediately opens the voltage source to the device. GFI devices are similar to circuit breakers but are designed to protect humans rather than circuit components.

Exercise 1. Read and memorize using a dictionary.

arrange _____	power source _____	branch _____	prevent _____
burn out _____	series circuit _____	fault _____	short circuit _____
fuse _____	socket _____	light bulb _____	_____
switch _____	melt _____	turn into _____	parallel circuit _____
_____	undue _____		

Exercise 2. Match the words with their definitions.

load switch	a device which interrupts the circuit
source fuse	a circuit in which wires are disconnected
closed circuit	a device which provides power
broken	a complete circuit with no breaks at all
circuit	a device which consumes electric power
	protective device

Exercise 3. Read the text again and answer the following questions.

What does a simple circuit consist of? What is the function of a switch?
 What happens to the lamp in a closed circuit? When does a short circuit occur? What can we use to prevent short circuits?
 Can you name some examples of loads? How does a fuse work?
 What is a generator?

Exercise 4. Complete the texts with the words in the box.

components	current	turn on	branch	amount
positive	appliances	continue	burns out	path

The (1) of a circuit can be wired in two different ways: series or parallel. If components are arranged one after another to form a single (2) path between the terminals and the components, the circuit is known as a series circuit. In this type of circuit, the (3) current flows from the negative terminal to the (4)

terminal, passing through all the other components of the circuit. This means that the (5) amount of energy passing through all the components in the series is the same.

The main disadvantage of a series circuit is that when a single component in the path (6) burns out, the entire circuit stops operating (e.g. Christmas tree lights).

A parallel circuit consists of several paths connecting the different components. Each separate

path is called a (7) branch of the circuit. Current from the source divides and flows through the different branches. Unlike series circuits, if one of the components in the parallel circuit burns out, the other paths (8) continue to operate. Parallel circuits are commonly used to connect (9) appliances at

home, so that each socket can function independently. For example, you don't have to (10) turn off the light in your room for the TV socket to work.

Exercise 5. Read the text and find synonyms for the words below.

A fuse can be added to an electric circuit to protect it from the effects of undue power. This safety device, which is made of a heat-sensitive alloy, is connected in series with the circuit it has to protect. If an excessive amount of current flows through the circuit, the alloy will liquefy and open the circuit. A circuit breaker is fundamental in a house to protect circuits against overloading, overheating and short circuits. The advantage of a circuit breaker is that it can be reset after the overloading by replacing the fuse. A professional electrician should always provide his customers with a map of the electric circuit in the house so that it will be easier to work on it in case of faults. excessive _____

reacting to high temperatures _____

to melt _____

loading up _____

adjusted _____

clients

Exercise 6. Give the derivatives to the following words:

connect _____

insulate _____

resist

depend _____

add _____

replace _____

differ

Exercise 7. Group the words that have contractive meanings (antonyms):

commonly _____

overloading

undue

rarely _____

underloading

excessive _____

insufficient _____

single

multiple _____

Unit 14

Мета заняття: Знати і розуміти математику, фізику, хімію на рівні, необхідному для досягнення результатів освітньої програми українською мовою та хоча б однією із поширених європейських мов.

HOW ENERGY IS PRODUCED



Nuclear power plants

About 10% of the world's electric power is produced by nuclear power plants. Nuclear power requires little fuel and causes much less air pollution than other power plants, but it can cause severe health and environmental problems when accidents occur, with a consequent release of radioactive material. This type of energy is produced by the splitting of atoms of uranium, which releases heat. This process - called fission - produces large amounts of steam, which is used to turn the blades of turbines thus creating energy. The main problems with nuclear power are linked to the location of the power plants, as people are not willing to have these plants near their homes, and the disposal of waste material, which stays radioactive for centuries.

Thermoelectric power plants

They provide about 2/3 of the world's electricity. These plants burn fossil fuels, such as coal, oil or natural gas, which are all non-renewable resources. This means that in the future there will be a limited supply of these resources. The main advantage of thermoelectric power plants is that they are reliable and can meet the demand in peak periods. Electricity is generated by heating water in a boiler to create steam, which is then pressurized and used to turn the blades of giant turbines that produce electricity. These power plants cause environmental pollution because of the combustion of fossil fuels which release carbon dioxide.

Hydroelectric power plants

The energy produced by water can be captured and turned into electricity. The use of a dam on a river allows hydroelectric power plants to store water in an artificial lake, or reservoir. When released, the force of the water spins the blades of giant turbines, which are connected to a generator producing energy. Hydropower is one of the most important renewable energy resources, because it is reliable, efficient and does not pollute the air. Although it has high initial costs, it is cheap to operate. Unfortunately, it has a great impact on the environment, as humans, animals and plants may lose their natural habitats. Exercise 1. Read and memorize using a dictionary

array _____ power plants _____ blade _____ to release _____ dam _____
 _____ reliable _____
 damage _____ renewable _____ environment _____
 to require _____ fuel _____ splitting _____
 greenhouse _____ steam _____ hot spring _____
 _____ stump _____ loss _____
 supply _____ maintenance _____ tide _____
 manure _____ turbine _____
 to occur _____ waste _____ piped _____ willing _____
 pollution _____

Exercise 2. Decide if the following sentences are true (T) or false (F), then correct the false ones.

Nuclear power plants do not produce air pollution at all.

Accidents in nuclear power plants can have terrible consequences for the environment.

Nuclear power plants produce biodegradable waste material.

Thermoelectric power is generated by the combustion of renewable resources.

Thermoelectric power plants are environmentally friendly.

Dams are built on rivers to store water.

The water released from the reservoir flows through the generator.

The only disadvantage of hydropower is its high initial cost.

Exercise 3. Read the texts about alternative power sources and complete the table with the missing information.

Environmental problems such as the greenhouse effect and air pollution have led scientists to find alternative power sources which are renewable and less polluting.

Sunlight can be directly converted into electricity by solar cells made of silicon. When light strikes the cells, a part of it is absorbed by the semiconductor material. The energy of the absorbed light knocks electrons loose, allowing them to flow freely and produce electricity. The process of converting light (photons) into electricity (voltage) is known as the photo-voltaic process (PV). Solar cells are usually combined into panels and grouped into arrays. Even if the initial costs can be high, the PV system provides an independent, reliable electrical power source. It can produce energy for more than 15 years and its routine maintenance is simple and cheap.

Wind energy is one of the cheapest renewable technologies available today. The wind turns the blades of giant turbines, producing in this way kinetic energy which is then converted into mechanical power and electricity by a generator. The main disadvantage of wind energy is that there are few suitable wind sites where it is possible to have a constant production of electricity. Tidal energy is typically used in coastal areas. The potential energy of tides is turned into electricity. Tidal power generators use rising and falling tides in much the same manner as hydroelectric power plants. Large underwater turbines are placed in areas with high tidal movements and are designed to capture the kinetic energy of rising and falling tides. The turbines are driven by the power of the sea both when the tide comes in and when it goes out. The problem with tidal power is that only massive increases in tides can produce energy and there are very few places where this occurs. Moreover, the aquatic ecosystem and the shoreline can be damaged by the changes in the tidal flow.

In the past, people used hot springs for bathing, cooking and heating. Geothermal energy is based on the fact that the Earth is hotter below the surface. The hot water which is stored in the Earth can be brought to the surface and used to drive turbines to produce electricity or it can be piped

through houses as heat. This energy is cheap and has a low impact on the environment, but there are few sites where it can be extracted at low cost.

Biomass is a renewable energy source deriving from plant material and animal waste. When it is burnt, it releases its chemical energy as heat. Biomass fuels include forest residues (such as dead trees, branches and tree stumps), straw, manure and even municipal solid waste. Biomass energy is a natural process, it is carbon neutral and has low initial costs. It used to be the main source of heating at home in the past and it continues to be highly exploited in the developing world. The main disadvantage of biomass is that it has a smaller potential than other energy sources and requires excellent maintenance skills.

Type of energy	How it works	Advantages	Disadvantages
			<i>high initial costs</i>
<i>Wind energy</i>			
		<i>It is a natural process because it exploits the potential energy of tides.</i>	

Exercise 4. Match the words with their definitions.

array a) a spot where hot water comes up naturally from the ground
kinetic b) unwanted material left after using tide c) a group of things arranged in a particular way
hot spring d) waste material from animals used as fertiliser
to pipe e) the process of keeping something in good condition by regularly checking it
manure f) produced by motion
waste g) to send a liquid or a gas through a tube
maintenance h) the regular change in the level of the sea caused by gravitational attraction of the moon and the sun

Exercise 5. Read the text about the electrical distribution system and complete it with the words in the box.

pole demand lower voltages consumers high-voltage power plants delivery appliances
network transformer

Electricity distribution is the final stage in the (1) _of electricity to end users. In order to be able to use electric power for our daily activities, electricity must be transmitted from the (2) _ to other areas where it can be distributed to different (3) _____. The electricity generated by power plants is increased or stepped up at substations and distributed through (4) _transmission lines, in order to minimize energy losses and to economise on the material needed for conductors. Transmission lines use voltages as high as 765,000 volts and they are usually connected in a (5)_. This means that if a station receives an unexpected (6) _for electric power, it can call on the other stations to help to meet the demand. Then electrical power is converted from high voltage to (7) _____ thanks to step-down transformers which turn electricity into

different power levels. Once it is sent to your neighbourhood, another small (8) __ mounted on a (9) _ converts the power to even lower levels to be used at home. The final voltage is between 110 volts - for lights, TVs, and other smaller appliances - and 240 volts for larger (10) _.

Exercise 6. Reorder the different stages in the distribution system and match them to the numbers in the picture.

Transmission lines carry high-voltage electricity to different substations.

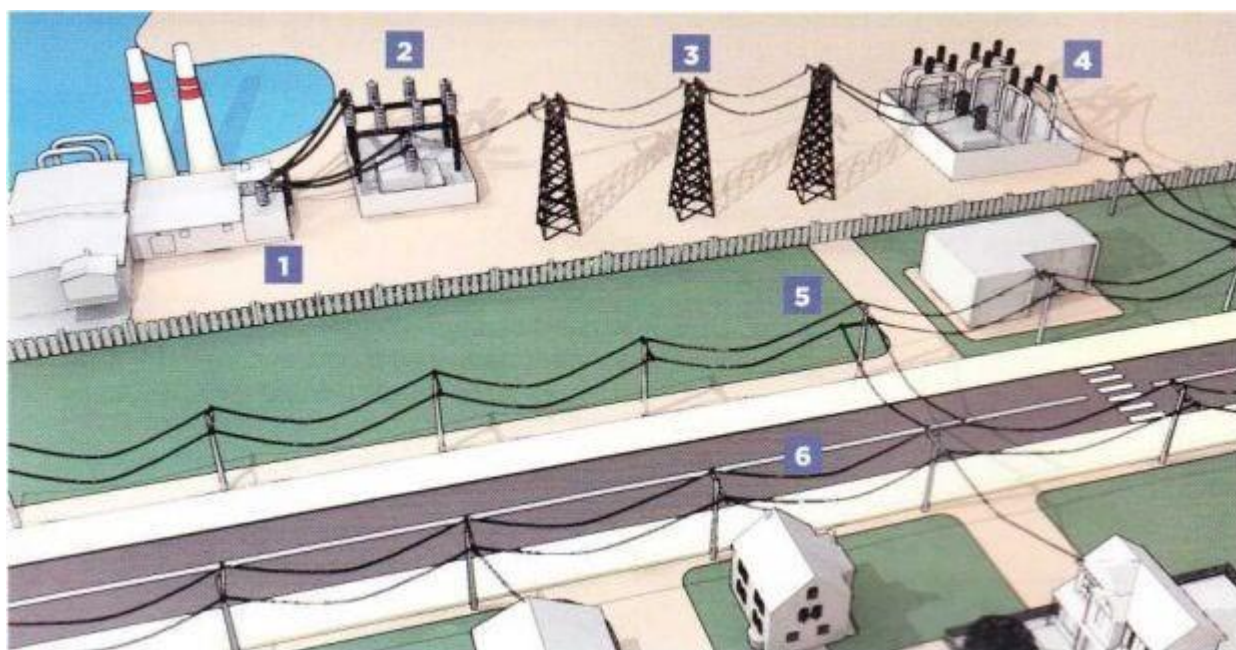
Electricity leaves the power plant.

Electricity is stepped down by transformers.

Current at lower voltages is transmitted to homes and offices.

The voltage is increased at a step-up station.

Power levels are lowered by small transformers mounted on poles.



Exercise 7. Read the text again and match each sentence with its ending.

Power plants generate a) convert electricity from high voltage levels to lower levels.

Transmission lines are used b) in case of an expected demand for electric power.

High voltages mean c) a reduction in energy losses during transmission.

Step-down transformers d) power and distribute it to substations.

Substations can help each other e) can be safely used in businesses and homes. The current transmitted by poles f) to distribute high-voltage electricity to a network of substations.

Exercise 8. What is your opinion on energy saving? What do you and your family usually do to save energy? Take this test and discuss your answers in pairs.

- 1 I turn my desk lamp on only when it's dark. Yes / No
- 2 I try to open the fridge as little as possible Yes / No 3 I don't use the lift to go down the stairs. Yes / No
- 4 My parents take the bus to work instead of driving. Yes / No
- 5 Our house temperature is below 20°C. Yes / No
- 6 I always turn the light off when I leave a room. Yes / No
- 7 I turn the TV off if I am not watching it. Yes / No

- 8 We try not to use air conditioning unless it's very hot. Yes / No
9 We use rechargeable batteries. Yes / No
10 We use energy-saving light bulbs. Yes / No

Unit 15

Мета заняття: Знати і розуміти інженерні науки, що лежать в основі спеціальності «Теплоенергетика» відповідної спеціалізації, на рівні, необхідному для досягнення інших результатів освітньої програми, в тому числі певна обізнаність в останніх досягненнях науки і техніки у сфері теплоенергетики.

ENERGY AND THE ENVIRONMENT

Energy consumption is inherent in almost all types of human activity, namely, home heating, cooking, moving vehicles, industry, agricultural production, etc. The development of diverse types of energy on a global scale has led to an unprecedented increase in living standards. Today's people are very energy dependent. We do not think about where the energy comes from, until we turn off the light or the heating. If this happens, we cannot fully live or work.

The main sources of energy available now to humans can be classified as follows:

- fossil fuel (coal and oil shale, oil, natural gas);
- nuclear and thermonuclear energy;
- renewable energy resources (energy of water, wind, sun, thermal waters, wood, peat, etc.).

Energy production significantly affects the state of environment. Combustion of fossil solid and liquid fuels is accompanied by the release of sulphur, carbon dioxide and carbon monoxide, as well as nitrogen oxides, dust, soot, and other pollutants.

Open-pit coal mining and peat extraction lead to changes in natural landscapes. Oil and oil product spills during production and transportation can destroy all living things in huge areas (water areas). Very bad impact on the landscape, flora and fauna is produced by the infrastructure necessary for coal, oil, and gas production.

Construction and operation of large hydroelectric power plants lead to: resettlement of people from the flooding zone, destruction of valuable fish species, for which dams become obstacles on the way to spawning area, loss of forests and high-fertile lands, increased risk of destructive earthquakes in the foothills and mountain areas, increased risk of catastrophic floods in areas downstream, change of landscapes and their destruction.

Nuclear power is potentially dangerous because of possible accidents at power plants, accompanied by the release of radioactive materials into the environment. In addition, there are problems of nuclear waste processing and disposal, which are very expensive and do not have a reliable engineering solution. Nuclear waste remains hazardous for hundreds and thousands of years. This topic is especially relevant for Ukraine, which suffered from the consequences of the Chernobyl nuclear power plant explosion.

Despite the obvious advantages, renewable energy sources can also have a negative impact on the environment. The operation of plants producing energy from renewable energy sources is associated with the withdrawal from circulation of significant land plots and is likely to be accompanied by some negative consequences for the environment in the future: landscape changes (windmills, solar panels), increased noise (wind turbines), soil pollution (geothermal power plants and biomass plants), harmful effects on other natural resources (tidal power plants).

In recent years, global politicians and people have expressed concerns about the escalation of global environmental problems – such as acid precipitation, climate change and the impact of these processes on the environment. Considering the above situation, energy saving can be

considered a rational decision. It should become a priority in the development strategy of any country because the reserves of traditional energy sources are limited.

Exercise 1 Look up new words given below in your dictionary and memorise them:

consumption, inherent, diverse, fossil fuel, oil shale, renewable, release, pollutants, pit coal mining, peat extraction, landscapes, destructions, impact resettlement, obstacles, spawning area, fertile lands, nuclear waste, withdrawal, acid precipitation

Exercise 2. Complete the collocations with the noun a-e. Study their Ukrainian translation

1. Oil ___ – нафтовий сланець	a. precipitation
2. open-pit coal ___ – видобуток вугілля відкритим способом	b. floods
3. acid ___ – кислотні опади	c. peat
4. ___ extraction – видобуток торфу	d. shale
5. catastrophic ___ – катастрофічні повені	e. mining

Exercise 3. Answer the following questions:

1. What has led to an unprecedented increase in living standards?
2. Why are people very energy dependent?
3. How can the main sources of energy be classified?
4. What significantly affects the state of environment?
5. What is combustion of fossil solid and liquid fuels accompanied by?
6. What can destroy all living things in huge areas (water areas).?
7. Why is nuclear power potentially dangerous?
8. What is the operation of plants producing energy from renewable energy sources associated with?
9. Why have people expressed concerns about the escalation of global environmental problems?
10. What should become a priority in the development strategy of any country?

Exercise 4. Decide whether the statements are true or false and correct them if necessary:

1. Living standards are directly proportional to energy consumption.
2. Extraction, mining and combustion of fossil fuels destroy the surface of the earth.
3. Surrounding area of hydroelectric power plants is destructed.
4. There are many reliable technologies of nuclear waste storage.
5. The use of renewables has positive consequences for the environment.
6. Lack of traditional energy sources is a matter of concern for people globally.
- Exercise 5. Which sentence on the right goes with the sentence on the left?

1. Energy consumption is	a, the state of environment.
2. We do not think about where the energy comes from,	b. to changes in natural landscapes
3. Energy production significantly affects	c. until we turn off the light or the heating. If this happens, we cannot fully live or work.
4. Open-pit coal mining and peat extraction	d. because of possible accidents at power plants
5. Nuclear power is potentially dangerous	e. inherent in almost all types of human activity

Exercise 6. Make up questions. Change the form of the verb, add the auxiliary one and the proper prepositions if necessary.

1. How / energy production influence / the environment?
2. What / open-pit coal mining, peat extraction, oil and oil product spills lead /?
3. How / construction and operation / hydroelectric power plants affect the surrounding area?
4. Why / to be / the topic / nuclear power especially relevant / Ukraine?
5. What /environmental problems / to be / to be / solve / in the near future?

Exercise 7

a) Form nouns from the given verbs:

to consume, to produce, to act, to classify, to depend, to extract, to dispose, to express, to precipitate, to circulate.

b) form adjectives from the given nouns: globe, agriculture, significance, value, hazard, destruction, catastrophe, explosion, advantage, harm.

Exercise 8. Fill in the gaps with the modal verbs: may, can, must.

1. _____ you speak French? Unfortunately, I speak only English.
2. You _____ smoke here, don't you know?
3. You _____ read this text: it is easy enough.
4. You _____ study hard to pass the exam.
5. Tony is very clever. He _____ speak three languages.
6. I'm interested in environment problems. I think we _____ learn to live in harmony with nature.
7. At what time _____ you come to the university?
8. _____ I take your dictionary? No, I'm still translating the text.
9. Peter _____ return the book to the library, we all want to read it.

Exercise 9. Fill in the gaps with the modal verbs: can, must, may, should.

1. I feel I _____ do something before it is too late.
2. You _____ work more, you _____ miss lessons.
3. Your questions surprise me, you _____ know this.
4. Though it is unpleasant mission, I feel I _____ tell him the truth.
5. He _____ answer the teacher's questions yesterday, but he _____ answer the same questions today.
6. He _____ not have learned the news, that's why he looks as if nothing had happened.

7. If you see anything unusual, you_____call the police.
8. You_____have studied the material thoroughly, you have no mistakes in the paper.
9. Libraries are quite free, and anyone who likes_____get books there.

Exercise 10. Compose a story on one of the topics (up to 100 words):

1. Today's people are very energy dependent
2. The main sources of energy available now to humans.
3. Impact on the environment caused by the production of electrical energy.

References:

Sopranzi S. Flash on English: Mechanics, Electronics and Technical Assistance

<https://www.ettoi.pl/PDF.../AKFlashonEnglishforMechanics...>

<https://www.britannica.com/technology/engineering> [The Routledge Handbook of Technology](#).

<https://books.google.com.ua/books?isbn=1317590759>

<https://www.forbes.com/.../7-technology-trends-that-will-do>.

..

<http://energopostachalnyk.com/en/electricity/>

