


**Фахова англійська мова для ділового
та наукового спілкування:**

методичні вказівки до виконання практичних робіт

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У методичних рекомендаціях наведені завдання до виконання практичних
роботи, які виконуються в процесі вивчення дисципліни.

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Вступ

Місія університету «МЕТІНВЕСТ ПОЛІТЕХНІКА» — підготовка висококваліфікованого та всебічно розвиненого фахівця, здатного до успішної конкуренції на глобальному рівні та сприяння зміцненню позицій держави у світовій спільноті. Важливим аспектом такої підготовки є засвоєння професійної термінології, яка забезпечує ефективну комунікацію з іноземними партнерами та інвесторами. Вільне володіння англійською мовою дозволяє подолати комунікаційні бар'єри між спеціалістами гірничовидобувної галузі з різних країн.

Програма курсу підготовки магістрів за спеціальністю «Фахова англійська мова для ділового та наукового спілкування» націлена на формування вміння працювати з професійними текстами, розширення спеціалізованого словникового запасу, а також розвиток комунікативних навичок усного та писемного мовлення на основі спеціалізованих матеріалів.

Методичні вказівки складаються з 6 тем, що відповідають програмі навчання першого семестру першого курсу. Курс є логічним продовженням попередньої підготовки та створює основу для подальшого поглибленого вивчення матеріалу. Опанування іноземною мовою вимагає систематичної, зосередженої роботи та самодисципліни.

Навчальний процес будується на інтеграції чотирьох видів мовленнєвої діяльності — читання, говоріння, аудіювання та письма — із залученням автентичних джерел іноземного походження та вітчизняних навчально-методичних ресурсів.

Результати навчання передбачають:

- вміння інтерпретувати зміст загальнонаукової літератури англійською мовою;
- навички усного та письмового спілкування з професійної та ситуативної тематики;
- засвоєння базового технічного словникового запасу;
- розпізнавання та розрізнення складних граматичних структур;
- здатність вести дискусію на професійні та ситуативні теми.

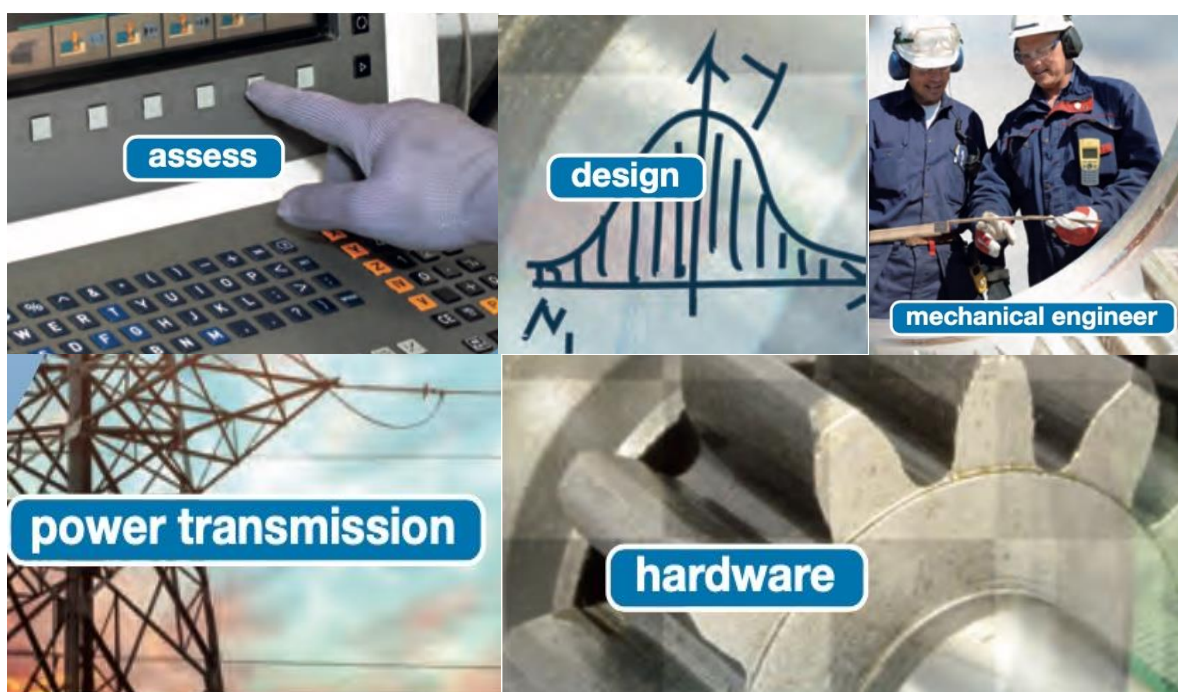
MODULE 1 ENGINEERING AS A CAREER

THEME 1 TODAY'S TOP CAREERS: ENGINEERING

PRE-READING EXERCISES

Look at the pictures and discuss:

1. What are some responsibilities of a mechanical engineer?
2. What qualifications does a mechanical engineer need?
3. Why is mechanical engineering important for modern industry?
4. Which branches of engineering do you think mechanical engineering is connected with?
5. What skills do you think are necessary for a mechanical engineer?



Essential vocabulary

to assess	оцінювати
hardware	металовироби, обладнання
to design	розробляти, проектувати
power transmission	лінія електропередач
manufacture	виготовляти, виробництво
device	пристрій, прибор
to improve	поліпшувати
to determine	визначати, встановлювати
to ensure	забезпечувати, гарантувати
to require	потребувати
diverse	різнобічний, різний
to specialize in	спеціалізуватися



Read the title “What is Mechanical Engineering?” and make predictions:

1. What topics do you expect in the text?
 - a. history of mechanical engineering
 - b. job responsibilities
 - c. famous engineers
 - d. industries where mechanical engineers work
 - e. required skills
 - f. description of machines
2. Which industries do you think will be mentioned?

Write 3 ideas.

Match the words with what you think they may mean. You will check after reading.

1. microscale sensors	a) Tools used for cutting, shaping, or forming materials
2. machine tools	b) Very small devices that detect physical properties
3. prosthetic devices	c) Artificial body parts or replacements
4. MEMS	d) Devices that convert chemical energy to electrical energy
5. fuel cells	e) Microelectromechanical systems; tiny machines inside electronics

Read and translate the text:

What is Mechanical Engineering?

Mechanical engineering is a diverse subject that derives its breadth from the need to design and manufacture everything from small individual parts and devices (e.g., microscale sensors and inkjet printer nozzles) to large systems (e.g., spacecraft and machine tools). They also assess the quality of existing machines. They adjust and improve the E designs as needed. Sometimes mechanical engineers even invent new types of hardware. A qualified mechanical engineer has an engineering degree. The role of a mechanical engineer is to take a product from an idea to the marketplace. The mechanical engineer needs to acquire particular skills and knowledge. He/she needs to understand the forces and the thermal environment that a product, its parts or its subsystems will encounter; to design them for functionality, aesthetics, and the ability to withstand the forces and the thermal environment they will be subjected to; and to determine the best way to manufacture them and ensure they will operate without failure. Perhaps the one skill that is the mechanical engineer’s exclusive domain is the ability to analyze and design objects and systems with motion.



Since these skills are required for virtually everything that is made, mechanical engineering is perhaps the broadest and most diverse of engineering disciplines. Most mechanical engineers specialize in a particular field. Mechanical engineers play a central role in such industries as automotive (from the car chassis to its every subsystem – engine, transmission, sensors); aerospace (airplanes, aircraft engines, control systems for airplanes and spacecraft); biotechnology (implants, prosthetic devices, fluidic systems for pharmaceutical industries); computers and electronics (disk drives, printers, cooling systems, semiconductor tools); microelectromechanical systems or MEMS (sensors, actuators, micropower generation); energy conversion (gas turbines, wind turbines, solar energy, fuel cells); environmental control (air-conditioning, refrigeration, compressors); automation (robots, data and image acquisition, recognition, control); manufacturing (machining, machine tools, prototyping, microfabrication).

Find the answers to the following questions:

1. What is Mechanical Engineering?
2. What is the role of mechanical engineer?
3. Name the skills which are needed for any mechanical engineer.
4. Where do mechanical engineers play a central role?
5. Why is mechanical engineering the broadest and most diverse of engineering disciplines?
6. What is the role of mechanical engineers in manufacturing?

Match the words or phrases (1-7) with the definitions (A-G).

1. test	a. the transfer of energy from one place to another to perform work
2. broad	b. a person who studies, builds, and works with machines
3. assess	c. machinery or mechanical components
4. hardware	d. to observe a machine's operations in order to determine it's functionality
5. manufacture	e. to build something in a factory
6. power transmission	f. involving a wide variety of topics or disciplines
7. mechanical engineer	g. to study and evaluate something

Read the sentences and choose the correct words or phrases

1. Mechanical engineers sometimes **specialize in/assess** a particular sub-field.
2. The design doesn't work, so the engineers need to



improve/manufacture it.

3. The client asked the engineer to **test/design** a nearly silent engine.

Match parts of sentences:

1. The mechanical engineer needs to acquire	a. automotive, biotechnology, computers and electronics, microelectromechanical systems, energy conversion and others.
2. Since these skills are required for virtually everything that is made, mechanical engineering is	b. is the ability to analyze and design objects and systems with motion.
3. Mechanical engineers play a central role in such industries as	c. particular skills and knowledge.
4. Mechanical engineers needs to understand	d. perhaps the broadest and most diverse of engineering disciplines.
5. Automation means	e. the forces and the thermal environment that a product, its parts, or its subsystems will encounter.
6. One skill that is the mechanical engineer's exclusive domain	f. robots, data and image acquisition, recognition, control.

Find the Ukrainian equivalents to the following words and word combinations:

machine tool, thermal environment, mechanical engineering, functionality, assess, microscale sensors, skills, ability, diverse, an energy conversion, semiconductor, manufacture, to operate without failure, automotive industry, virtually, be subjected to, improve.

Навички, крихітні датчики, працювати без збоїв, здатність, практично, термальне середовище, різнобічний, автомобільна промисловість, оцінювати, виробляти, напівпровідник, машинобудування, перетворення енергії, бути підданим чомусь, поліпшувати, функціональне призначення.

Listen to a conversation between an engineer and an interviewer. Mark the following statements as true (T) or false (F).

1. ___ The company is looking for someone to design new engines.
2. ___ The man's experience includes assessing older engine models.
3. ___ The woman offers the man the position.

Listen again and complete the conversation.

Engineer: Hi, I'm Ian Moore. I'm here for an
1 _____.

Interviewer: It's nice to meet you, Ian. Tell me about
your work experience.

Engineer: Well, I 2 _____ Osterbell
Incorporated for twelve years.

Interviewer: What were your 3 _____ ?

Engineer: I assessed old engine models. Then I
made suggestions to 4 _____ them.

Interviewer: Did you 5 _____ any engines?

Engineer: Not on my own. I designed new parts
for older models.

Interviewer: If we hire you, you'll design 6 _____
_____ as well.

Branches of Engineering:



Mechanical Engineering

Mechanical engineering is the study of physical machines that may involve force and movement. It is an engineering branch that combines engineering physics and mathematics principles with materials science, to design, analyze, manufacture, and maintain mechanical systems.



Electrical engineering

Electrical engineering is an engineering discipline concerned with the study, design, and application of equipment, devices, and systems which use electricity, electronics, and electromagnetism. **Electrical** engineers build devices for communication purposes, power distribution and **electrical** component manufacturing units producing everyday appliances.



Electronic engineering

Electronic engineering is a sub-discipline of electrical engineering which is distinguished by the additional use of active components such as semiconductor devices to amplify and control electric current flow.



Civil Engineering

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, airports, sewage systems, pipelines, structural components of buildings, and railways.



Chemical Engineering

Chemical engineering is an engineering field which deals with the study of operation and design of chemical plants as well as methods of improving production. Chemical engineers develop economical commercial processes to convert raw materials into useful products.



Aeronautical Engineering

Aerospace engineering is the primary field of engineering concerned with the development of aircraft and spacecraft. It has two major and overlapping branches: aeronautical engineering and astronautical engineering. Avionics engineering is similar, but deals with the electronics side of aerospace engineering.



Industrial engineering

Industrial engineering is an engineering profession that is concerned with the optimization of complex processes, systems, or organizations by developing, improving and implementing integrated systems of people, money, knowledge, information and equipment. Industrial engineering is central to manufacturing operations.




Petroleum Engineering

Petroleum engineering is a field of engineering concerned with the activities related to the production of Hydrocarbons, which can be either crude oil or natural gas. Exploration and production are deemed to fall within the upstream sector of the oil and gas industry.



Environmental engineering

Environmental Engineering is an emerging branch of engineering that applies the principles of science and engineering to improve the



environmental factors like air, water, and/or land resources from the harmful effects of pollution and to provide healthy resources for one and all.

Here are some projects on which an engineer might work. Indicate which branch of engineering (mechanical, civil, chemical, etc.) would be involved. Some of the projects may involve more than one kind of engineering; if so, indicate all of those you think should be included.

1. A suspension (підвисний) bridge over a large body of water. –
2. Finding a new alloy (mixture) of metals that will serve certain special purposes. –
3. Designing a control system for the safe operation of a nuclear reactor in an electric power plant. –
4. Designing the wings for a new type of airplane. –
5. Designing an automatic switching system for telephone direct-dealing (прямий телефонний зв'язок). –
6. Installing an automated conveyer belt in an automobile assembly plant.-
7. Testing the strength of materials to be used in the construction of a sports stadium. –
8. Designing a rocket for space exploration that will use nuclear-powered motors. –
9. Improving the braking system in an automobile. –
10. Finding a process for extracting a higher percentage of uranium from uranium ore. –

Answer the questions to the text

1. What is the main focus of **Mechanical Engineering**?
2. What four key activities do mechanical engineers perform with mechanical systems?
3. What are the three core phenomena (electricity, electronics, electromagnetism) that **Electrical Engineering** is concerned with?
4. According to the text, what are three application areas for electrical engineers?
5. How is **Electronic Engineering** distinguished from Electrical Engineering? What specific components does it use?
6. What does **Civil Engineering** deal with? List at least four examples of "public works" from the text.
7. What is the primary goal of a **Chemical Engineer**, as stated in the text?
8. **Aerospace Engineering** has two major branches. What are they?
9. What engineering field deals specifically with the *electronics* of aircraft and spacecraft?
10. What is the central concern of **Industrial Engineering**? Name three of the integrated systems it works with, according to the text.



11. What is the primary focus of **Petroleum Engineering**, and how does it differ fundamentally from the focus of **Environmental Engineering**?
12. What are the two main objectives of **Environmental Engineering**, as described in the passage?

Discussion questions:

1. If you wanted to work on renewable energy projects like wind turbines or solar farms, which engineering discipline(s) from the list would be most relevant, and why?
2. The development of a smartphone involves several engineering fields. Which ones do you think are most critical, and what part would each play?
3. Based on these definitions, which engineering field do you think has the broadest scope of work, and which seems the most specialized? Justify your choices.
4. If you were to invent a new medical diagnostic device, which combination of engineering skills (e.g., Mechanical for parts, Electronic for sensors, Chemical for reagents) would you need, and why?



THEME 2 TRAITS OF ENGINEER

PRE-READING EXERCISES

Match the words with their definitions. You are about to read a text about engineering. Based on these words, what do you think the main idea of the text will be?

Before reading the text think about difference between an engineer and a scientist.

1. To design	a) A method of solving problems by trying different solutions until one works.
2. Ingenious	b) Relating to the most basic and important parts of something.
3. Trial and error	c) The increase in the amount of goods and services produced in a country.
4. Simulations	d) Extremely clever, inventive, and effective.
5. Fundamental	e) To plan or invent something, especially with cleverness.
6. Phenomena	f) Computer models that imitate a real process or situation to study its behavior.
7. Integral	g) Essential and necessary for completeness.
8. Economic growth	h) Observable facts or events in nature or society.

Read the following statements. Before reading the text, mark them as *T (True)*, *F (False)*, or *NS (Not Sure / I don't know)* based on your current knowledge.

1. The word "engineer" is related to the word "genius."
2. An engineer's work is very similar to a scientist's work; they both mainly try to discover new laws of nature.
3. A key part of engineering is using mathematics and science to solve practical problems.
4. The best way for engineers to design something new is through repeated trial and error.
5. The main goal of engineering is to advance mathematics and scientific knowledge for its own sake.



Read and translate the text:


The word “engineering” derives from the Latin root *ingeniere*, meaning to design or to devise, which also forms the basis of the word “ingenious.” Those meanings are quite appropriate summaries of the traits of a good engineer. At the most fundamental level, engineers apply their knowledge of mathematics, science, and materials - as well as their skills in communications and business - to develop new and better technologies. Rather than experiment solely through trial and error, engineers are educated to use mathematics, scientific principles, and computer simulations as tools to create faster, more accurate, and more economical designs.

In that sense, the work of an engineer differs from that of a scientist, who would normally emphasize the discovery of physical laws rather than apply those phenomena to develop new products. Engineering is essentially a bridge between scientific discovery and product applications. Engineering does not exist for the sake of furthering or applying mathematics, science, and computation by themselves. Rather, engineering is a driver of social and economic growth and an integral part of the business cycle.

Mechanical engineering deals with anything that moves including the human body – a very complex machine.

Mechanical engineers learn about materials, solid and fluid mechanics, thermodynamics, heat transfer, control, instrumentation, design and manufacturing to understand mechanical systems. Specialized mechanical engineering subjects include biomechanics, cartilage-tissue engineering, energy conversion, laser- assisted materials processing, combustion, MEMS (microelectromechanical systems), microfluidic devices, fracture mechanics, nanomechanics, mechanisms, micropower generation, tribology (friction and wear), and vibrations. The American Society of Mechanical Engineers (ASME) currently lists 36 technical divisions from advanced energy systems and aerospace engineering to solid-waste engineering and textile engineering.

The breadth of the mechanical engineering discipline allows students a variety of career options beyond some of the industries listed above. Regardless of the particular path they envision for themselves after they graduate, their education will have provided them with the creative thinking that allows them to design an exciting product or system, the analytical tools to achieve their design goals, the ability to overcome all constraints, and the teamwork needed to design, market, and produce a system. These valuable skills could also launch a career in medicine, law, consulting, management, banking, finance, and so on.



For those interested in applied scientific and mathematical aspects of the discipline graduate study in mechanical engineering can lead to a career of research and teaching.

Essential vocabulary

trait	рiса
basis	основа
to apply	застосовувати
application	застосування
discovery	вiдкриття
integral	невiд'ємний, iстотний
to move	рухатись
complex	складний
heat transfer	теплообмiн
to launch	починати, запускати
processing	обробка, переробка
division	пiдроздiл, роздiл, розподiл
solid-waste	твердi вiдходи
option	варiант, вибiр
to provide	забезпечувати
to allow	дозволяти
to achieve	досягати
to overcome	долати, переборювати

Find the answers to the following questions:

1. What does the word "engineering" mean?
2. Where do engineers apply their knowledge?
3. What are engineers educated to?
4. What do mechanical engineers learn about?
5. What do specialized mechanical engineering subjects include?
6. How many technical divisions do you know?
7. What can lead to a career of research and teaching?



Find the Ukrainian equivalents to the following words and word combinations:

Heat transfer, to deal with, textile engineering, to overcome all constraints, solid mechanics, micropower generation, fluid mechanics, creative thinking, combustion, fracture mechanics, a variety of, solid waste, breadth, launch a career, communications, fundamental level, business cycle, product applications, experiment solely through trial and error, for the sake of furthering or applying.

Mark the following statements as true (T) or false (F).

1. Mechanical engineering deals with anything that is at rest.
2. The American Society of Mechanical Engineers (ASME) currently lists 41 technical divisions.
3. Specialized mechanical engineering subjects include a lot of fields such as biomechanics, cartilage-tissue engineering, energy conversion, etc.
4. Nanomechanics is one of the subjects of electrical engineering.
5. Such valuable skills as the creative thinking and the teamwork could also help mechanical engineers make a career in medicine, law, consulting, management, banking, finance, and so on.
6. Mechanical engineers can learn about design and manufacturing to understand mechanical systems.

Here are three discussing questions based on the text about the nature and role of engineering

1. *Etymology and Essence*

Based on its Latin root, what two core concepts are embedded in the word "engineering"? According to the passage, why are these concepts an appropriate summary of a good engineer's traits?

2. *Contrast with Science*

How does the text differentiate the fundamental goal of an **engineer** from that of a **scientist**? What is the metaphorical "bridge" that engineering creates?

3. *The Engineer's Toolkit*

The passage states that engineers do not rely solely on "trial and error." What three primary intellectual tools do they use instead to develop their designs, and what are the intended outcomes of using these tools (e.g., faster, more economical)?

Before reading the passage, discuss these questions:

1. What are good qualities for engineers to have?
2. How can these qualities be developed?

Discuss the meaning of these words:

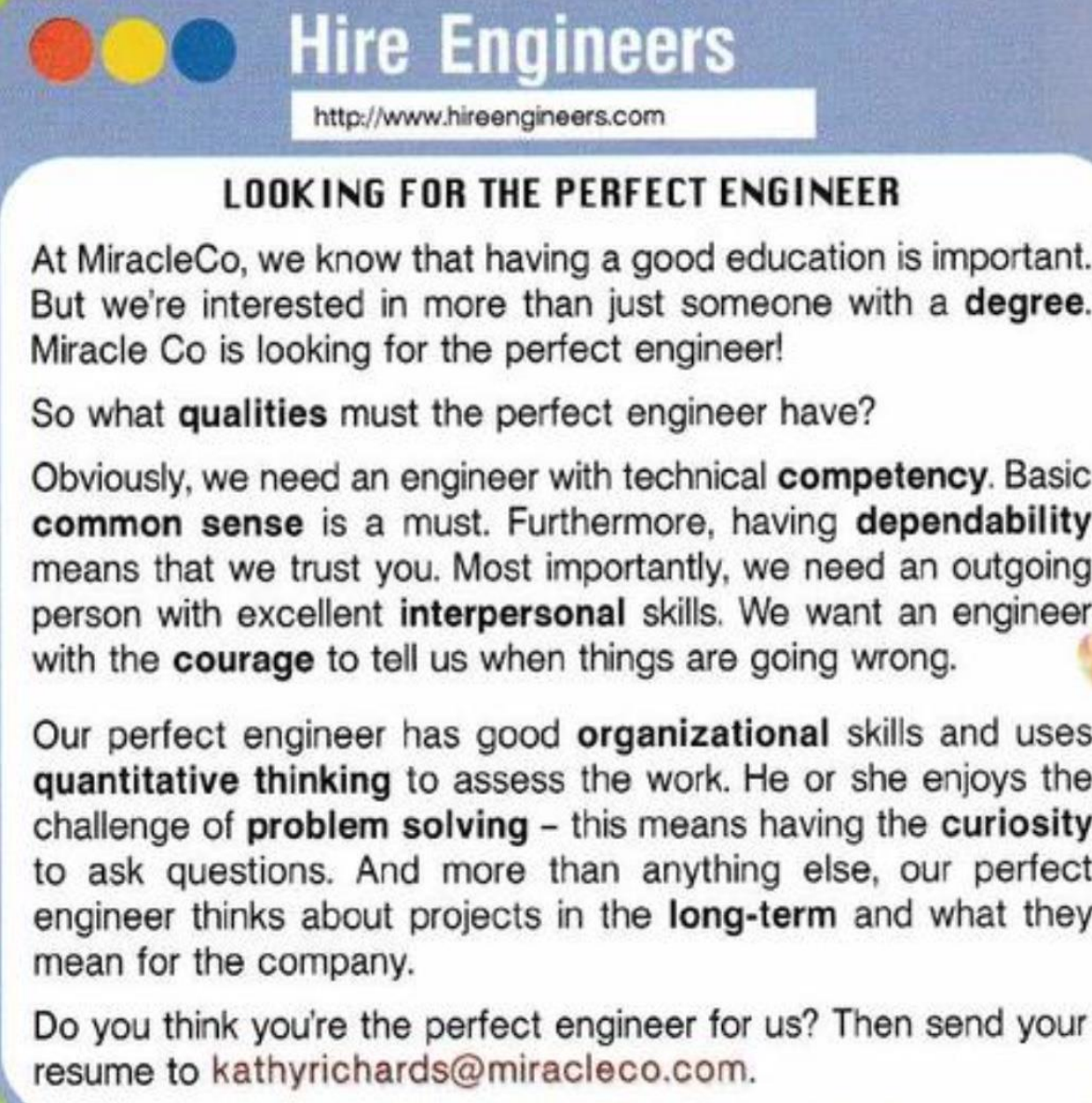
Degree

Curiosity

Organization

Interpersonal

Quantitative thinking



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LOOKING FOR THE PERFECT ENGINEER

At MiracleCo, we know that having a good education is important. But we're interested in more than just someone with a **degree**. Miracle Co is looking for the perfect engineer!

So what **qualities** must the perfect engineer have?

Obviously, we need an engineer with technical **competency**. Basic **common sense** is a must. Furthermore, having **dependability** means that we trust you. Most importantly, we need an outgoing person with excellent **interpersonal** skills. We want an engineer with the **courage** to tell us when things are going wrong.

Our perfect engineer has good **organizational** skills and uses **quantitative thinking** to assess the work. He or she enjoys the challenge of **problem solving** – this means having the **curiosity** to ask questions. And more than anything else, our perfect engineer thinks about projects in the **long-term** and what they mean for the company.

Do you think you're the perfect engineer for us? Then send your resume to kathyrichards@miracleco.com.

Read this job posting. Then, choose the correct answers.

1 What is the posting about?

- A minimum education requirements
- B years of experience applicants must have
- C an engineering position's responsibilities

- D characteristics of a potential employee

2 What is NOT listed as an important quality?

- A bravery
- B reliability
- C punctuality
- D curiosity

3 What can you infer about MiracleCo?

- A It is hiring several engineers at this time.
- B It focuses on short-term projects.
- C It values long-term thinking more than courage.
- D Its current employees lack interpersonal skills.

Match the words (1-7) with the definitions (A-G).

1. organizational skills —
2. problem solving —
3. dependability —
4. curiosity —
5. common sense —
6. degree —
7. quantitative thinking —

- A. trustworthiness
- B. completion of academic study
- C. using numbers in thought
- D. finding solutions
- E. basic practical knowledge
- F. ability to keep things in order
- G. interest in learning

Complete the sentences. Fill in the blanks with the correct words from the word bank.


Word Bank

Courage, long-term, interpersonal, competence, quality

1. Carl was fired because he lacked basic _____.
2. Think about your future and _____ career goals.
3. Bob's _____ skills help him communicate well.
4. Alanna's best _____ is her curiosity.
5. It takes _____ to admit you made a mistake.

Translate these sentences from Ukrainian into English.

1. Сучасний інженер повинен володіти глибокими знаннями з математики та фізики.

- 
2. Вміння визначати та вирішувати різні проблеми є запорукою подальшого успіху.
 3. Іноваційні рішення та покращення технічних процесів ґрунтуються на креативному мисленні сучасного інженера.
 4. Успішний керівник завжди зможе давати рекомендації та обговорювати деталі проектів з командою та підрядниками.
 5. Інженерія, насправді, є мостом між науковими відкриттями та застосуванням продукту.



THEME 3 HISTORY OF ENGINEERING

PRE-READING EXERCISES

Match the English terms with their Ukrainian equivalents.

English	Ukrainian
1. lever	а) клин
2. fulcrum	б) похила площина
3. wheel and axle	с) важіль
4. pulley	д) точка опори (вісь обертання)
5. wedge	е) колесо і вісь
6. inclined plane	ф) гвинт
7. screw	г) блок (поліспаст)

Listen to the descriptions of the following machines. Which simple machine does each represent?

1. A person lifting a heavy rock with a long stick.
2. A wheelbarrow carrying sand.
3. A flag being raised on a pole.
4. A ramp used to load goods into a truck.
5. A spiral staircase.

Before reading, mark whether you think each statement is *True (T)* or *False (F)*.

1. A lever always has the fulcrum in the middle.
2. A wheelbarrow is an example of a second-class lever.
3. The screw is a form of an inclined plane.
4. Pulleys can only be used to lift water from wells.
5. Mechanical advantage means making work easier with less force.

Read and translate the text:

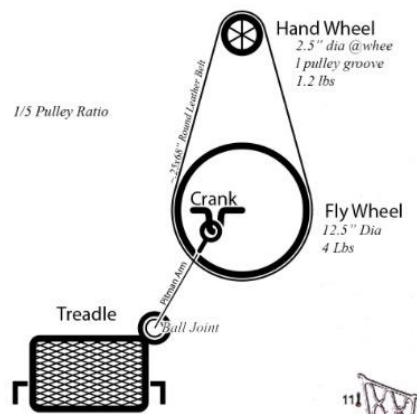
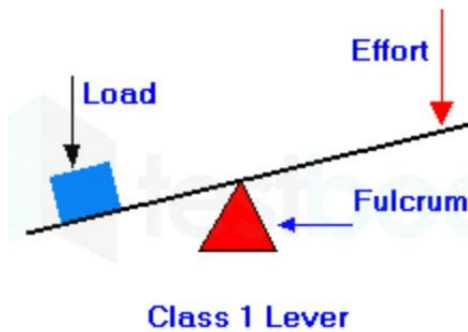
Basic machines


When a prehistoric man or woman used a stick to pry up a stone, the *lever* was invented. A lever is a rigid piece or bar, like the early person's stick, which turns on a point called the *fulcrum*. When force is applied at a second point, that force is transmitted to a third point where it can perform work. A children's seesaw is an excellent example of a lever. The point of balance on which the seesaw rests is the fulcrum; when downward force is applied to one end, the other end rises.

There are three classes of levers. The seesaw is a lever of the first class, with the fulcrum between the point where force is applied – *the effort*

end – and the point where there is resisting force – *the load end*. The wheelbarrow is a lever of the second class, with the load between the fulcrum and the effort. The fulcrum is in front, the load is in the wheelbarrow itself and the effort is applied behind the load. A foot-treadle is a lever of the third class with the effort between the fulcrum and the load. The fulcrum is at one end, force in the form of pressure from the foot is applied behind the fulcrum, and the load is still farther beyond the point where the foot presses down.

We can observe that a seesaw will balance when a heavier person at the effort end is a short distance from the fulcrum and a lighter person at the load end is farther from the fulcrum. This is an illustration of the law of the lever: the effort force times its distance from the fulcrum is equal to the resisting force times its distance from the fulcrum when the lever is balanced.





The *wheel and axle* is the second basic type of machine. Like the lever, the wheel goes back to prehistoric times when someone probably discovered that it was easier to move heavy weights by sliding them on logs than by carrying them. The axle is a shaft on which a wheel can turn and the wheel and axle combination may have first been used sometime around 3,000 B.C. for water-raising devices. Its use for transportation evolved with the domestication of the horse. War chariots were the tanks of ancient times and wagons were the trucks.

In addition to its uses for transportation the wheel has endless applications. An early and important one was for the potter's wheel which permitted craftspeople to shape clay into controlled thickness for greater variety of forms and uses. Wheels were also put to work early for irrigation by raising water from streams or wells to divert it into artificial channels. Other early uses were for millstones to grind grains and for waterwheels that could transmit energy for many purposes.

The potential of the wheel was increased by the development of the *crank*. The crank is a device which can transmit motion or can change rotary motion into reciprocating motion and the reverse. With the development of the crank, waterwheels could be put to work for essential purposes such as crushing rock or sawing wood.

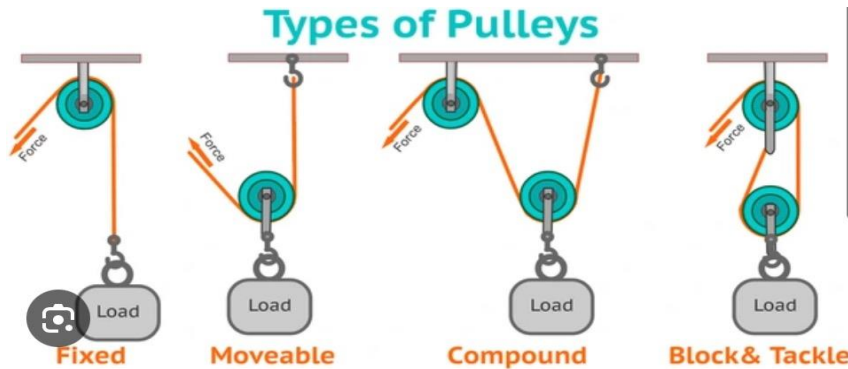


The third basic machine is the *pulley*. In its simplest form it consists of a wheel with a groove around its outer surface through which a rope, wire, or chain can be passed. This simple device was used in ancient times for tasks such as raising water from wells or streams and hoisting sails onto ships. A pulley contained in housing is called a *block*. When a fixed block is used with a movable block to which a weight is attached, downward pull on the rope will raise the weight. This device is called a *block and tackle*.

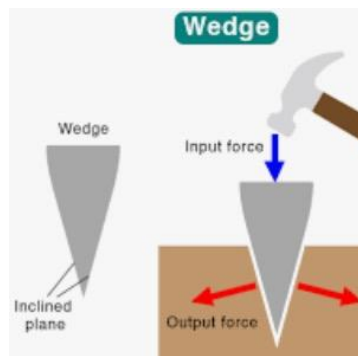
The block and tackle has a mechanical advantage of two. The mechanical advantage can be increased by different arrangements and combination of blocks.

A movable pulley acts on the leverage principle; it forms a lever of the second class. Increasing the number of fixed and movable pulleys increases the mechanical advantage.

The three remaining basic machines are so related to one another that they are sometimes grouped together. They are the *wedge*, the inclined plane, and the *screw*.



The *wedge* is a triangle with two chief surfaces that meet in a sharp angle. Wedges are used for splitting open or pushing apart. They were used from very early times for such purposes as quarrying rock, plowing fields or cutting wood, as an axe. A nail is a familiar form of the wedge. The mechanical advantage of a wedge can be computed by dividing the length of the surface by the breadth of the wedge. A wedge twelve inches long with a breadth of three inches would have a theoretical mechanical advantage of four. However, friction is an important consideration in use of the wedge; in reality much of the advantage is lost. In fact, it is friction that holds a nail in place.



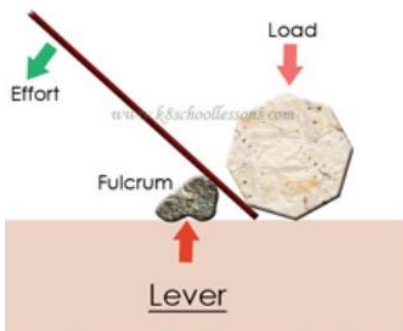
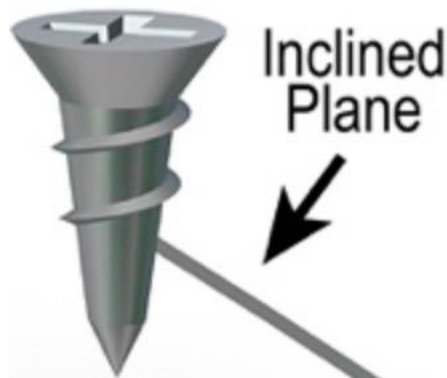
The inclined plane was the probable method employed by the Egyptians for manipulating into place the huge blocks of stone in the pyramids. Early men and women knew that a weight could be pushed up a hill with less effort than would be required to move the same weight vertically. Many centuries had to pass before it was discovered that this mechanical device could be explained mathematically. The effort put forth in moving a load up an inclined plane is the same as the proportion between the height of the rise and the length of the inclined plane.

The inclined plane is an important factor that concerns civil engineers when designing highways or railroads. The mechanical engineer more frequently



uses the screw, a spiral form of the inclined plane. The figure that results from wrapping the line of an inclined plane around a cylinder is called a *helix*. The screw was used in ancient times to press grapes for wine or olives for oil. In the Middle Ages it was important in the development of printing. Today we are most familiar with the screw as a fastener but it has numerous other uses. It is one of the most important devices for amplifying or increasing force. A familiar adaptation is the screw *jack* used to lift automobiles or any great weight through a short distance. The screw is also a major means of changing the direction of motion.

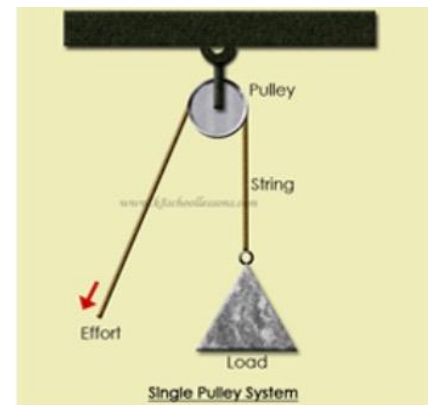
Both the screw and the helix have so many adaptations in modern machines that it is impossible to list them but one in particular is extremely interesting: the helican motion of a propeller on a boat or an airplane moves the vessel or plane ahead as though it were screwing its way through the water or air!



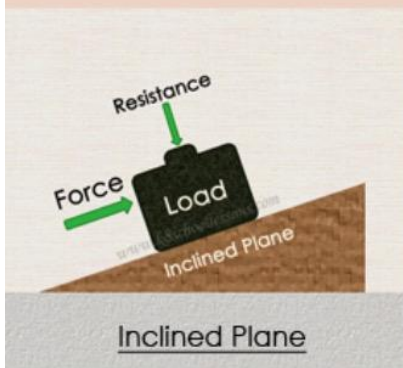
Lever



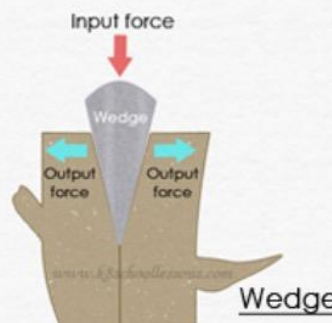
Wheel and Axle



Single Pulley System



Inclined Plane



Wedge



Screw

Simple Machines




Essential vocabulary

to invent – винаходити	To carry – нести, переносити
weight - вантаж	downward - вниз
lever – важіль	shaft – вал
to turn - обертатися	arrangement - розташування
fulcrum – точка опори	to evolve – розвивати
to shape - сформувати	to split – колоти, розбивати
to apply – застосовувати	to raise – підіймати
application - застосування	length – довжина
to rise – підніматися	to permit – дозволяти
to grind - молоти	breadth - ширина
to resist - противитися, опиратися, протистояти	reciprocating motion -зворотно- поступальний рух
to transmit - передавати	friction - тертя
force – сила	to hold – утримувати
rotary motion - обертальний рух	to employ – застосовувати, використовувати
effort – зусилля	inclined plane – похила площина
to crush – дробити, давити	to require - потребувати
far – farther - the farthest – далекий – віддалений - найвіддаленіший	weight – вага
groove – паз, жолоб	screw - гвинт
to slide – ковзати	fastener – закріплювач
to pass - проходити	to amplify – посилювати, збільшувати

Answer the questions to the text

1. Who is credited with inventing the lever according to the text?
2. What is a lever, and what is its main function?
3. What is a fulcrum, and why is it important in the operation of a lever?
4. How does a seesaw serve as an example of a first-class lever?
5. What are the positions of the fulcrum, effort, and load in a second-class lever like a wheelbarrow?
6. How does the foot-treadle demonstrate the properties of a third-class lever?
8. What is the "law of the lever" as described in the text?
9. What were some early uses of the wheel and axle mentioned in the text?
10. What is the primary function of a crank?
11. Why is the invention of the crank considered significant in mechanical advancements?

- 
12. What is the basic structure of a pulley?
 13. How was the pulley used in ancient times?
 14. How does a block and tackle system work?
 15. What principle does a movable pulley operate on?
 16. What is the shape of a wedge?
 17. What are the primary uses of a wedge?
 18. How does friction impact the mechanical advantage of a wedge?
 19. How is the effort needed to move a load up an inclined plane mathematically explained?
 20. What is a helix, and how is it formed?
 21. What is the most familiar modern use of the screw?
 22. What is the purpose of a screw jack?
 23. How does the screw amplify or increase force?


Choose the correct answer.

1. In a first-class lever, the fulcrum is:
 - a) between the effort and the load
 - b) at the load end
 - c) at the effort end
2. The law of the lever states that when balanced:
 - a) effort equals load
 - b) $\text{effort} \times \text{distance} = \text{load} \times \text{distance}$
 - c) $\text{effort} + \text{distance} = \text{load} + \text{distance}$
3. Which simple machine is a spiral form of an inclined plane?
 - a) wedge
 - b) pulley
 - c) screw
4. What holds a nail in place?
 - a) glue
 - b) friction
 - c) magnetism
5. A block and tackle is a type of:
 - a) lever
 - b) pulley system
 - c) wheel and axle

Fill in the blanks

Use words from the text.

1. The point on which a lever turns is called the _____.
2. The _____ is a triangular tool used for splitting.
3. A _____ changes rotary motion into linear motion.

- 
4. The mechanical _____ of a pulley system can be increased by adding more wheels.
 5. An _____ plane reduces the force needed to lift a load.

Short answer questions. Answer in your own words.

1. Give one example from the text of how ancient people used the wheel.
2. What is the main purpose of a block and tackle?
3. How does friction affect the use of a wedge?
4. Why is the screw considered an important machine in engineering?

Application task

Imagine you need to lift a heavy box onto a high shelf. Which simple machine(s) would you use? Describe your setup and explain why it would work.



THEME 4 HISTORY OF ROBOTS

PRE-READING EXERCISES

Match the English terms with their Ukrainian equivalents.

English term	Ukrainian equivalent
1. robot	a) штучний інтелект
2. industrial	b) передові технології виробництва
3. artificial intelligence	с) автоматизований пристрій, що виконує завдання
4. mythology	d) робот, схожий на людину
5. automaton	e) пов'язаний з виробництвом та фабриками
6. advanced manufacturing	f) автономний механічний пристрій
7. android	g) давні легенди та міфи

Before reading, try to place these events in chronological order (1–5).

- First digitally controlled robots appear (1960s)
- Ancient myths about artificial beings
- First industrial robots in factories
- Robots working alongside humans today
- Industrial Revolution begins


True or False Prediction

1. Robots were first invented in the 20th century.
2. Ancient Greek myths included stories about mechanical servants.
3. The first robots were used in homes, not factories.
4. Today's robots can work alongside humans.
5. Advanced manufacturing does not require teamwork.

Read and translate the text:

History of Robots: Early legends

The history of robots has its origins in the ancient world. The modern concept began to develop with the onset of the Industrial Revolution which allowed the usage of complex mechanics and the subsequent introduction of electricity. In the early 20th century the notion of a humanoid machine was developed. Today, it is possible to imagine human sized robots with the capacity for near human thoughts and movement.



The first uses of modern robots were in factories as industrial robots – simple fixed machines capable of manufacturing tasks which allowed production without the need for human assistance. Digitally controlled industrial robots and robots making use of artificial intelligence have been built since the 1960s. Concept of artificial servants and companions date at least as far back as the ancient legends of Cadmus who sowed dragon teeth that turned into soldiers and the myth of Pygmalion whose statue of Galatea came to life. Many ancient mythologies included artificial people, such as the talking mechanical handmaidens built by the Greek god Hephaestus (Vulcan to the Romans) out of gold, the clay golems of Jewish legend and clay giants of Norse legend. Chinese legend relates that in the 10th century BC, Yan Shi created human-like automaton according to a story from a text by *Lie Zi*.

In Greek mythology, Hephaestus created utilitarian three-legged tables that could move independently and the bronze man Talos, who defended Crete.

In Indian mythology the Buddha's relics were guarded by mechanical robots until they were disarmed by King Ashoka.


In the Egyptian legend of Rokaila, Set's younger brother created a palace and tomb with free-standing statues that lived out people's lives so realistically that they were mistaken for having souls.

In Christian legend, Albertus Magnus was supposed to have constructed an entire android capable to perform some household tasks, but it was destroyed by Albertus' student Thomas Aquinas for disturbing his thoughts.

Designing a Robot

Advanced manufacturing is the use of technology to improve products and processes. Professionals involved in advanced manufacturing processes and systems must be able to identify problems, create solutions, think critically, effectively communicate as part of a team, and apply new technologies and skills.

Robotics is branch of technology that deals with the design, construction, operation, and application of robots. Robotics plays an important role in science, technology, engineering, and mathematics because it encourages hands-on learning and the integration of science, engineering, and creative thinking. Robots are working for us every day in countless ways. Robots can address a broad range of national needs that include advanced manufacturing. In advanced manufacturing robots work with, beside and sometimes instead of people to improve processes, create efficiencies, and perform specific skills.



The first generation of industrial robots were installed in a permanent position and carried out simple tasks and routines. Later generations of robots were programmed to carry out specific actions over and over again; others were more flexible having to identify objects before performing a task.

Today's robots work with or beside people to extend or increase human capabilities. Along with increasing productivity in the manufacturing sector today's robots assist with dangerous missions, help scientists accelerate discoveries, and improve our safety and well-being.

Some robots are referred to as vibrobots. With a vibrobot the vibration of the motor makes the robot wobble across the table. This type of robot uses vibrating motors to move. Energy is changing from one form to another. Light energy from the sun changes to heat energy in the rocks, soil, and water on Earth's surface.

People make use of energy transformations in nearly every application of modern life, including transportation, industry, and in their use of household appliances and devices. Vehicle engines change chemical energy in gasoline to kinetic energy. In many power plants chemical energy in coal or other fossil fuels changes to heat energy as it is burned to heat water and produce steam. Heat energy in the boiling water changes to kinetic energy of the pressurized steam which spins turbines associated with generators that change kinetic energy to electrical energy. This electrical energy is then used to power everything from industrial machines to household appliances. For example, electric ovens change electrical energy to heat energy and light bulbs change electrical energy to light energy. Battery-powered devices change chemical energy in batteries to electrical energy and then to other forms of energy.



Essential vocabulary

ancient - стародавній

Concept – поняття, концепція

Onset - початок

to develop - розвиватися

artificial intelligence – штучний інтелект

to relate – відноситись, розповідати

to defend - захищати

to perform - виконувати

to tame – приручити

capacity – здатність, продуктивність, потужність

artificial – штучний

robotics – робототехніка

range – спектр, ряд, діапазон

hands-on – практичний

encourage – заохочувати

permanent – постійний, стійкий

to carry out – виконувати

application – застосування, вживання, використання

to wobble – коливатися, хитатися

capability – можливість, здатність

solution – рішення

advanced – продвинутий

flexible – гнучкий

to boil – кипіти

Choose the correct answer.

1. The modern concept of robots began to develop during:
 - a) Ancient times
 - b) The Industrial Revolution
 - c) The 21st century
2. The first modern robots were used in:
 - a) Homes
 - b) Factories
 - c) Hospitals
3. Which ancient culture had a legend about Yan Shi creating an automaton?
 - a) Greek
 - b) Chinese
 - c) Egyptian
4. What did Albertus Magnus supposedly create?
 - a) A flying machine
 - b) An android
 - c) A talking statue
5. Today's robots are designed to:
 - a) Replace all human workers
 - b) Work alongside humans
 - c) Only perform simple repetitive tasks



Match the mythological story with the correct culture.

Story / Character	Culture
1. Talos, the bronze man	a) Jewish legend
2. Golems made of clay	b) Greek mythology
3. Mechanical handmaidens of gold	c) Christian legend
4. Albertus Magnus' android	d) Norse legend
5. Clay giants	e) Greek god Hephaestus

Answer the questions

1. When did the history of robots start?
2. What did many ancient mythologies include?
3. When were the first uses of modern robots?
4. Who created utilitarian three-legged tables in Greek mythology?
5. Who protected the Buddha's relics?
6. What could an entire android created by Albertus Magnus perform?
7. What steps do manufacturers take to design and build a product?
8. What role does robotics play in manufacturing?
9. How has the robotics changed?
10. How are products manufactured?
11. How is energy transferred between objects or systems?
12. What are the applications of energy transformations in modern life?
13. What is your opinion on early legends of robots?

Using words from the text fill in the blanks

1. Robots that look and act like humans are called _____.
2. The _____ Revolution allowed the use of complex mechanics in robot development.
3. _____ manufacturing uses technology to improve products and processes.
4. The first generation of industrial robots performed simple _____.
5. Robotics integrates science, engineering, and _____ thinking.

Decide which statement is true (T) or false (F)

1. The history of robots has its origins in the ancient world.
2. In the early 19th century, the notion of a humanoid machine was developed.
3. The first uses of modern robots were in factories as industrial robots.
4. Simple fixed machines were capable of manufacturing tasks which



allowed production without the need for human assistance.

5. Many ancient mythologies included artificial animals.

6. According to Christian legend Albertus Magnus constructed an android capable to speak and sing.

Find Ukrainian equivalents to the following words and word combination

Humanoid machine, artificial intelligence, origin, human assistance, Industrial Revolution, lightning, to construct, ancient world, digitally controlled industrial robots, human sized robots, talking mechanical handmaidens, to perform domestic tasks, robotics, modern concept, autonomous robot, manufacturing tasks, to spread, to create solutions, to move, to play an important role, in countless ways, to extend or increase human capabilities, light energy, household appliances and devices, kinetic energy, a vehicle engine, fossil fuels, to wobble, the pressurized steam, battery-powered devices, to spin turbines, our safety and well-being.

Match the words with their definitions.

1. Concept	a) A branch of engineering and technology that deals with designing, constructing, and operating robots.
2. Artificial Intelligence (AI)	b) Refers to processes or machines operated using digital systems, such as computers or microcontrollers.
3. Robotics	c) A general idea or understanding of something, often abstract, which serves as a framework or model for interpretation.
4. Capacity	d) A significant period of technological advancement that began in the late 18th century. It marked the transition from manual labor and handcrafted goods to machine-driven manufacturing processes.
5. Digitally controlled	e) The maximum amount or volume that something can contain or handle.
6. Human assistance	f) A field of computer science focused on creating systems or machines capable of performing tasks that typically require human intelligence.
7. Industrial revolution	g) The involvement of humans in guiding or aiding processes, often in collaboration with machines or automated systems.



Translate the following sentences into English

1. Промислова революція, яка розпочалася 200 років тому в Європі, сьогодні поширюється у всьому світі.
2. Одним із досягнень сучасної робототехніки є створення роботів розміром з людини.
3. Людство почало створювати роботів ще у стародавньому світі.
4. Походження слова "робот" маловідоме.
5. Людиноподібна машина може виконувати домашні справи.
6. Промислові роботи з цифровим керуванням дуже корисні на виробництві.
7. Щоб сконструювати робота, потрібно мати базові знання у галузі робототехніки.
8. Кваліфіковані працівники відіграють важливу роль у машинобудівній промисловості.
9. Інженери витратили багато часу, щоб знайти (розробити) вирішення проблеми дизельних двигунів.
10. Світлова енергія – це єдина форма енергії, яку ми справді (безпосередньо) можемо побачити.
11. Может ли использоваться солнечная энергия для того, чтобы вращать турбины?
12. Нові технології необхідні для того, щоб розширити та збільшити можливості людини.

Work in pairs or small groups. Discuss:

1. If you could design a robot to help with one problem in today's world, what would it do and why?
2. Do you think robots will ever completely replace human workers in some fields? Why or why not?
3. How can studying the history of robots help us understand their future development?

THEME 5 THREE LAWS OF MOTION

PRE-READING EXERCISES

Match the English terms with their Ukrainian equivalents.

English term	Ukrainian equivalent
1. motion	a) прискорення
2. gravity	b) сила
3. force	c) рух
4. acceleration	d) гравітація, тяжіння
5. mass	e) інерція

6. inertia	f) маса
7. reaction	g) дія
8. action	h) протидія, реакція

Before reading, mark whether you think each statement is True (T) or False (F).

1. Isaac Newton was born in the 17th century.
2. Newton discovered only one law of motion.
3. The first law of motion is also called the law of inertia.
4. Force equals mass divided by acceleration.
5. For every action, there is an equal and opposite reaction.

Listen to the descriptions of the scenarios. Which law of motion might each represent?

1. A book lying on a table that doesn't move unless someone pushes it.
2. A person pushing a heavy box vs. a light box.
3. A rocket launching into space.

Read and translate the text:


Three Laws of Motion

Sir Isaac Newton was one of the greatest scientists and mathematicians that ever lived. He was born in England on December 25, 1643. He was born the same year that Galileo died. He lived for 85 years.

While Newton was in college he was writing his ideas in a journal. Newton had new ideas about motion, which he called his three laws of motion. He also had ideas about gravity, the diffraction of light and forces. Newton's ideas were so good that Queen Anne knighted him in 1705. His accomplishments laid the foundations for modern science and revolutionized the world.

According to Newton's first law an object at rest will remain at rest unless acted on by an unbalanced force. An object in motion continues in motion with the same speed and in the same direction unless acted upon by an unbalanced force. This law is often called "the law of inertia". This means that there is a natural tendency of objects to keep on doing what they're doing. All objects resist changes in their state of motion. In the absence of an unbalanced force an object in motion will maintain this state of motion.

According to Newton's second law acceleration is produced when a force acts on a mass. The greater the mass (of the object being accelerated), the greater the amount of force needed (to accelerate the object). Everyone unconsciously knows the Second Law. Everyone knows that heavier objects



require more force to move the same distance as lighter objects. For an object with a constant mass m , the second law states that the force F is the product of an object's mass and its acceleration a : $F = m \cdot a$.

This is an example of how Newton's Second Law works: Mike's car which weighs 1,000 kg is out of gas. Mike is trying to push the car to a gas station and he makes the car go 0.05 m/s. Using Newton's Second Law you can calculate how much force Mike applies to the car. Answer = 50 newtons.

According to Newton's third law for every action there is an equal and opposite reaction. This means that for every force there is an opposing force that is equal in size, but opposite in direction. That is to say that whenever an object pushes another object it gets pushed back in the opposite direction equally hard.

Let's study how a rocket works to understand Newton's Third Law. The rocket's action is to push down on the ground with the force of its powerful engines, and the reaction is that the ground pushes the rocket upwards with an equal force.

Essential vocabulary

law – закон

foundation – основа

to remain – залишатись

to continue – продовжуватись

acceleration – прискорення

amount – кількість, обсяг

friction – тертя

to propel – рухати, штовхати

Choose the correct answer.

1. Isaac Newton was knighted by:
 - a) King Charles
 - b) Queen Anne
 - c) Queen Elizabeth
2. Newton's first law is also known as the law of:
 - a) gravity
 - b) inertia
 - c) acceleration
3. According to Newton's second law, force equals:
 - a) mass \times acceleration



- b) mass \div acceleration
- c) acceleration \div mass
- 4. If an object is at rest and no unbalanced force acts on it, it will:
 - a) start moving slowly
 - b) remain at rest
 - c) disappear
- 5. According to Newton's third law, every action has:
 - a) a smaller reaction
 - b) an equal and opposite reaction
 - c) no reaction

Match each law of motion with its correct example or description.

Law	Example / Description
1. First Law	a) Pushing a car requires more force if it is heavier.
2. Second Law	b) A rocket pushes gases down, and the gases push the rocket up.
3. Third Law	c) A ball rolling on a flat surface slows down due to friction.
	d) An object at rest stays at rest unless pushed.

Fill in the blanks using words from the text

1. Isaac Newton was born in _____ in 1643.
2. Newton's ideas about _____ led to his three laws of motion.
3. The natural tendency of objects to keep doing what they are doing is called _____.
4. The formula for Newton's second law is _____.
5. Mike's car example shows how to calculate _____ using Newton's second law.

Connect parts of sentences

1. Sir Isaac Newton was	a. gravity, the diffraction of light, and forces.
2. Newton had new ideas about	b. the greater the amount of force needed (to accelerate the object).
3. Newton received both	c. one of the greatest scientists and mathematicians that ever lived.

4. According to Newton's first law	d. a bachelor's and master's degree.
5. He also had ideas about	e. for every action there is an equal and opposite reaction.
6. According to Newton's third law	f. motion, which he called his three laws of motion.
7. According to Newton's second law acceleration is produced when a force acts on a mass. The greater the mass	g. an object at rest will remain at rest unless acted on by an unbalanced force.

Answer the questions.

1. Why is Newton considered one of the greatest scientists in history?
2. Explain Newton's first law in your own words.
3. Why is Newton's first law called "the law of inertia"?
4. How does the example of Mike's car demonstrate Newton's second law?
5. Describe an everyday example of Newton's third law (not from the text).

Find Ukrainian equivalents for the following words and phrases:

be interested in, unbalanced force, to revolutionize the world, upwards, diffraction of light, speed, direction, powerful engine, in motion, acceleration, gravity, equal, at rest, amount of force, lay the foundations

Solve the problem using Newton's second law ($F = m \times a$).

A bicycle has a mass of 15 kg.

If it accelerates at 2 m/s^2 , how much force is applied?

Think of your own example (with numbers) and calculate the force.

Translate sentences into English

1. Багато сучасних винаходів кардинально змінили світ.
2. Великий вчений Ісаак Ньютон заклав основи класичної фізики.
3. Ньютон цікавився такими науками, як: фізика, математика та астрономія.
4. Дифракція світла було відкрито Ф. Гримальді наприкінці XVII століття.
5. Тіло перебуває у стані спокою, якщо воно не піддається впливу інших тіл.
6. Після закінчення університету він отримав ступінь бакалавра та магістра в галузі машинобудування.



7. Його досягнення заклали основи сучасної науки та зробили революцію у науковому світі.
8. Згідно з другим законом Ньютона, прискорення виникає, коли сила діє на масу.
9. Для кожної сили існує сила протидії, рівна за величиною, але протилежна за напрямом.



THEME 6 SHAPES AND MEASUREMENT

PRE-READING EXERCISES

Before you read the passage, talk about these questions.

1. What types of measurement systems are there?
2. Why do engineers label all measurements?

Match the words on the left with their meanings on the right.

1. imperial measurements	a) a unit of volume in the metric system
2. metric system	b) a unit of mass in the metric system
3. liter	c) a system of measurement based on meters, liters, and grams
4. gallon	d) a unit of volume in the imperial system
5. kilogram	e) a unit of mass in the imperial system
6. pound	f) a system of measurement based on feet, inches, gallons, and pounds

Before reading, guess whether these statements are True (T) or False (F).

1. The text is about a successful project completion.
2. The problem is related to using different measurement systems.
3. The American engineer is using the metric system correctly.
4. The team needs to use imperial measurements.
5. Mistakes in measurements can cause serious problems.

Red and translate the passage.


We have a problem with the project we're working on. The American engineer we are working with is using imperial measurements. This is incorrect. We all need to use the metric system.

Please inform the American engineer of the following:

The pipes we are using are 4.5 meters (450 centimeters) each, not 4 feet, 5 inches. Also, each pipe holds 15 liters, not 15 gallons. And the weight of the frame is no more than 20 kilograms, instead of 20 pounds. Mistakes like this make a big difference. Someone needs to contact him about this.

Read this email from an engineer to his co-worker. Then mark the following statements as True (T) or False (F).

1. The project team is having a problem with an American engineer.

- 
2. The American engineer is correctly using the metric system.
 3. The team requires everyone to use imperial measurements.
 4. The correct length of each pipe is 4.5 meters.
 5. Each pipe holds 15 gallons according to the correct specifications.
 6. The frame should weigh no more than 20 kilograms.
 7. The engineer's use of feet and inches for pipe length is correct.
 8. Mistakes in measurement units do not cause significant issues.

Write a word that is similar in meaning to the underlined part.

1. The boy is over one hundred centimeters tall!
_ e _ _ r
2. Is that 200 imperial weight measurements or kilograms?
p _ _ n _ _
3. There is only one thousand milliliters of soda left.
_ _ t _ r
4. The measurement is just one one-hundredth of a meter off.
_ e _ _ i _ _ t _ _
5. The United States' system of measurement uses gallons.
_ _ _ e r _ _ l _ y _ t _ _
6. A ruler is a twelve inch length long.
_ o _ t

Use the words from the word bank to fill in the blanks.

Word Bank


Metric, gallons, kilograms, inch

1. Get seven _____ of water.
2. Daniel's design only weighs seventeen _____.
3. The _____ system is used worldwide.
4. That worm is less than a(n) _____ long!

Red and translate the passage.

Know your measurements

Fasteners and tools use **imperial** measurements or **metric**, and knowing the difference is important. It prevents you from **rounding off** a fastener, damaging tools, or causing injury. If you don't know an item's size, use a **micrometer** or other **caliper** to measure it. Check **centimeters** or **millimeters** for metric tools. Look at **inches** for imperial tools.



Volume and weight are also very different in the two systems. Using **quarts** when a formula calls for **liters** is very dangerous. A **cubic inch** is totally different from a **cubic meter**. For weights, a **pound** cannot substitute for a **kilogram**. Always pay close attention to which system is required. If you must use tools from the other system, refer to a table of **conversion**.

Read the magazine article. Then, fill in the blanks using words from the word bank.

Word Bank

Measurements, centimeters, liters, pounds, systems, fasteners

There are two 1 _____ of measurement. Using the right one is important. It prevents damage to 2 _____. The metric system uses 3 _____ for distance, while the imperial system uses inches. Other types of 4 _____ are also different in the two systems. Volumes in quarts and 5 _____ are not interchangeable. Neither are weights in 6 _____ and kilograms.

Match the words (1–8) with the definitions (A–H).

1. liter —
 2. pound —
 3. imperial —
 4. round off —
 5. conversion —
 6. cubic inch —
 7. centimeter —
 8. micrometer —
- A.** changing from one system into another
 - B.** a metric measure of length or distance
 - C.** an imperial measure of volume
 - D.** to damage a screw or bolt
 - E.** a tool that measures small distances
 - F.** the system that uses inches and quarts
 - G.** an imperial measure of weight
 - H.** a metric measure of volume

Write a word that is similar in meaning to the underlined part.



1. The carpenter measured the bolt heads with a tool with adjustable legs.
_ a l _ _ e r
2. I have imperial wrenches, but I need one that is part of the system based on the meter.
_ e _ _ i c
3. This tank holds one unit equal to 1000 liters of liquid.
_ u _ i _ m _ t _ _
4. The size of the screw was eight units equal to 1/10 of a centimeter.
_ _ l l _ m _ _ _ r s
5. Add six units of imperial volume.
_ u a _ _ s
6. Steven accidentally recorded the weights in pounds instead of units of metric weight.
k _ _ o _ r _ _ s
7. How many units of imperial length is that rope?
i _ _ _ e s

Match the words (1–6) with the definitions (A–F).

1. Celsius —
 2. convert —
 3. milliliter —
 4. Fahrenheit —
 5. fluid ounce —
 6. temperature —
- A.** a measurement that uses the scale in which water boils at 100°.
 - B.** to change something into a different form or system
 - C.** an imperial unit of volume
 - D.** the measure of how hot or cold something is
 - E.** a metric unit of volume
 - F.** a measurement that uses the scale in which water boils at 212°.



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Навчально-методичне видання

Бурковська Оксана Йосипівна

**Фахова англійська мова для ділового
та наукового спілкування:**

методичні вказівки до виконання практичних робіт

Самостійне електронне мережеве видання

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