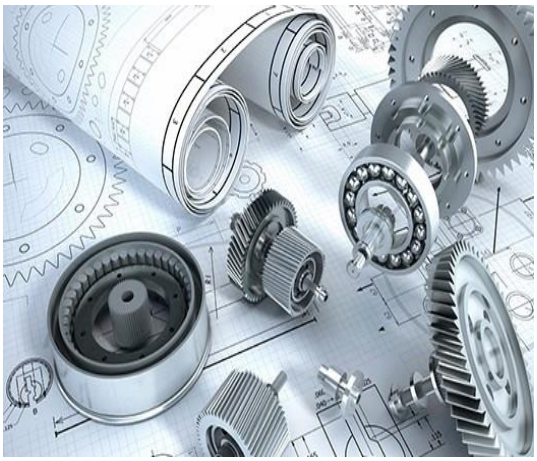
UNIT 1
The Engineering Profession

Remember the new words and word-combinations:

aeronautical and aerospace	- авіакосмічна техніка
chemical engineering	- хімічне машинобудування
civil engineer	- інженер-будівельник
civil engineering	- громадське будівництво
communication and control	- техніка засобів зв'язку
computers engineering	- комп'ютерна техніка
deal (with) ***(v)***	- мати справу з, працювати
design ***(v)***	- конструювати, проектувати, оформляти
device	- пристрій
electric power and machinery	- енергетика і енергомашинобудування
electrical engineer	- інженер-електротехнік
electronic engineering	- електроніка
engine	- двигун
engineering	- інженерна справа, техніка, машинобудування, будівництво
enterprise	- підприємство
equipment	- обладнання
mechanical engineer	- інженер-механік
mechanical engineering	- машинобудування
naval engineering	- кораблебудування
nuclear engineering	- ядерна техніка
occupation	- професія
operating engineer	- інженер-експлуатаційник
research and development	- дослідження і розвиток
safety engineering	- техніка безпеки
structural design	- проектування конструкцій

Task 1. Read and translate the text "The Engineering Profession".

The engineer typifies the 21-st century. Engineering is one of the most ancient occupations in history. Without the skilled engineers our present-day civilization could never have evolved. Engineering is the profession that puts scientific knowledge to practical use.



The principal work of an engineer is design, construction and operation of machines, engines and other devices. Engineer is a person who has received technical education and has a basic knowledge of other engineering fields, because most engineering problems are complex and interrelated. He designs new products, machines and mechanisms.

The engineer must also have an understanding of the various processes and materials and could be working in any of the following areas: the organization of manufacture, research and development, design, construction, marketing and education. Engineers have a direct role in the creation of most of modern technology - the tools, materials, techniques, and power sources that make our lives easier.

The word *"engineering"* comes from the Latin word "*ingeniare"*, which means to design or to create but it is difficult to translate into Ukrainian because it has a lot of meanings (інженерна справа, техніка, машинобудування, будівництво). There are the following branches of engineering: civil, mechanical, electronic, communication and control, computers, naval, nuclear, chemical, safety, electric power and machinery, aeronautical and aerospace engineering.

Within the field of mechanical engineering the major subdivision is industrial engineering which is concerned with complete mechanical systems for industry rather than individual machines.

After graduation from my educational establishment I am going to work at an agricultural enterprise as a mechanical engineer. It is a very important profession as an engineer is a person who organizes the production process of an agricultural enterprise and controls the proper maintenance of the machinery and equipment. The work of an engineer requires creative ability, analytical frame of mind and a working knowledge of scientific principles.

Task 2. Give the English equivalents to the following words and word combinations; make sentences with them:

найдавніша професія, кваліфікований, проектування і будівництво, інші пристрої, базові знання в галузі техніки, складні та взаємопов'язані, нові механізми, дослідження та розробка, інженерна справа, машинобудування, сільськогосподарське підприємство, належне технічне обслуговування машин і обладнання, творчі здібності, наукові принципи.

Task 3. Are the sentences true or false? Correct the false sentences:

1. Engineer is a person who has not received technical education.
2. Without the skilled engineers our present-day civilization could never have evolved.
3. Engineer has to design new products, machines and mechanisms.
4. The term engineering is easy to translate into Ukrainian because it has a lot of meanings.
5. Civil engineering, mechanical engineering, electronic engineering, electric power and machinery are branches of management.
6. After graduation from the University I'll be a good engineer.
7. The work of an engineer doesn't require creative ability, analytical frame of mind.

Task 4. Complete the following sentences using the information from the text:

1. The … typifies the 21-st century.
2. The principal work of an engineer is …, … and operation of …, engines and other devices.
3. There are the following branches of …: civil engineering, mechanical engineering, electronic engineering.
4. After graduation from the University I am going to work at an … … as a mechanical engineer.
5. The work of an engineer requires … …, analytical frame of mind and a … … of scientific principles.
6. I am going to work at an agricultural enterprise as … … ..

Task 5. Answer the following questions to discuss the topic "The Engineering Profession":

1. What is one of the most ancient occupations in history?
2. What is the principal work of an engineer?
3. Must the engineer have an understanding of the various processes and materials or not?
4. How can we translate the word "engineering"? What is the Ukrainian for this term?
5. What branches of engineering do you know?
6. What do engineers deal with?
7. You are going to work as a mechanical engineer after graduation from the University, aren't you?
8. What does the work of an engineer require?

Task 6. Match each word in the column A with its synonym from the column B.

A	B
1. engineer	a. operation
2. profession	b. construct
3. enterprise	c. instrument
4. design	d. occupation
5. machinery	e. branches
6. device	f. mechanic
7. fields	g. company
8. work	h. equipment

Task 7. Translate the text and: a) make a plan covering the main ideas of the text; b) put questions and let your group-mates answer them.

My Speciality "Engineering"

I am a student of Vinnytsia National Agrarian University and I specialize in engineering as the engineering profession is responsible for much of today's industrial technology which has benefited people in numerous ways.

Mechanical Engineering involves the production, transmission, and use of mechanical power. Mechanical engineers design, operate, and test all kinds of machines. They develop and build engines that produce power from steam, gasoline, nuclear fuels, and other sources of energy. They also develop and build a wide variety of machines that use power, including

air-conditioning, heating, and ventilation equipment; machine tools; and industrial-processing equipment. Mechanical engineers are involved in every phase in the development of a machine, from the construction of an experimental model to the installation of the finished machine and the training of the workers who will use it.

Mechanical engineers work in many industries, such as power generation, public utilities, transportation, and all types of manufacturing. Many mechanical engineers concentrate on research and development because new types of machinery are continually in demand. Mechanical engineers are involved in almost every other branch of engineering, whenever a new or improved machine, device, or piece of equipment is required.

The typical academic program for the University students is composed of a varying number of courses or subjects within a field of specialization. The courses are designed to equip students with the knowledge and practical skills required for engineers and applied scientists in a wide range of industrial sectors, government organizations and research laboratories.

Many students conduct research or project work which is directly relevant to their interests and career ambitions.

Task 8. Choose the variant that best completes the sentence.

1. Mechanical engineers develop and build … that produce power from steam, gasoline, nuclear fuels, and other sources of energy.

a) cars; b) devices; c) engines;

2. Mechanical engineers work in many … , such as power generation, public utilities, transportation, and all types of manufacturing.

a) companies; b) industries; c) plants;

3. The academic program for the University students is composed of a varying number of … .

a) machines; b) tewachers; c) courses;

4. The students get knowledge and practical skills required for … and applied scientists in a wide range of industrial sectors.

a) engineers; b) managers; c) students;

5. As for me I specialize in … .

a) mechanics; b) electronics; c) engineering;

6. The engineering profession is responsible for much of today's industrial … which has benefited people in numerous ways.

a) technology; b) production; c) manufacturing.

Task 9. Work with your partner. Ask and answer the questions in the box about the engineers' job.

Do you …?	Do you have to …?	Did you have to …?
work inside (outside)	wear a uniform	study at college
earn a lot of money	work overtime	do a lot of training
work with machines	get up early	
use a computer	speak English	
interact with farmers	do research	
have work experience	know much	
love your job	go abroad	

Task 10. Translate the following sentences into English.

1. Робота інженера пов'язана з конструюванням і розробкою машин, двигунів та інших пристроїв.
2. Інженери отримують технічну освіту та мають основні знання з інших галузей інженерії.
3. Термін "інженерна справа" має багато значень, тому його важко перекласти українською мовою.
4. Громадське будівництво, комп'ютерна техніка, хімічне машинобудування – це сфери інженерії.
5. Інженер організовує виробничі процеси підприємства, контролює відповідне обслуговування машин та обладнання.
6. Інженери приймають безпосередню участь у створенні більшості сучасних технологій, інструментів, матеріалів, методів та джерел живлення, які роблять наше життя простішим.

Task 11. Complete the text using the words from the box.

What does an automotive engineer really do?

automotive engineers; production; industry;
drive; professions; solutions; transport;

Automotive engineering is one of the most exciting … you can choose. From the global concerns of sustainable mobility, and teaching cars to … themselves, to working out how we'll get around on the surface of Mars, automotive engineering is all about the future.

Automotive engineers work in every area of the … , from the look and feel of current cars, to the safety and security of new forms of… . Attempting to make cars as fast as possible while keeping them fuel efficient may seem like an impossible task, but this is the kind of problem … … deal with every day.

The work of an automotive engineer breaks down into three categories:

- Design: designing new products and improving existing ones.
- Research and Development: finding … to engineering problems.
- Production: planning and designing new … processes.

Task 12. a) Match the words to make phrases.
b) Use the word combinations in your own sentences.
c) Make a dialogue using both phrases and sentences.

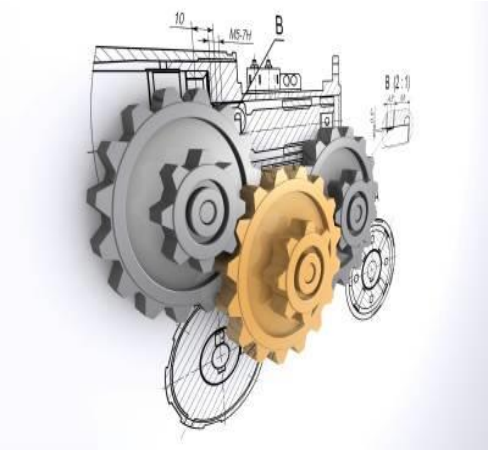
1. ancient	a. education
2. principal	b. processes
3. technical	c. establishment
4. engineering	d. engineering
5. various	e. work
6. mechanical	f. enterprise
7. educational	g. occupations
8. agricultural	h. fields

Task 13. Discuss with you group-mate(s):

- *Your friend who is 20 years old works as a car mechanic. He wants to continue his education in order to become an engineer. He doesn't know which faculty to choose. Help him to solve his problem. Give your reasons. Work in pairs.*

Task 14. Read and translate the text "The Science of Mechanics".

Mechanics is the branch of science concerned with the behavior of physical bodies when subjected to forces or displacements, and the subsequent effects of the bodies on their environment. The scientific discipline has its origins in Ancient Greece with the writings of Aristotle and Archimedes. During the early modern period, scientists such as Galileo, Kepler, and especially Newton, laid the foundation for what is now known as classical mechanics. It is a branch of classical physics that deals with particles that are either at rest or are moving with velocities significantly less than the speed of light. It can also be defined as a branch of science which deals with the motion of and forces on objects.



Mechanical engineering is a discipline of engineering that applies the principles of engineering, physics and materials science for analysis, design, manufacturing, and maintenance of mechanical systems. It is the branch of engineering that involves the production and usage of heat and mechanical power for the design, production, and operation of machines and tools. It is one of the oldest and broadest engineering disciplines.

The engineering field requires an understanding of core concepts including mechanics, kinematics, thermodynamics, materials science, structural analysis, and electricity. Mechanical engineers use these core principles along with tools like computer-aided engineering, and product lifecycle management to design and analyze manufacturing plants, industrial equipment and machinery, heating and cooling systems, transport systems, aircraft, watercraft, robotics, medical devices, weapons, and others.

Mechanical engineering emerged as a field during the industrial revolution in Europe in the 18th century; however, its development can be traced back several thousand years around the world. Mechanical engineering science emerged in the 19th century as a result of developments in the field of physics. The field has continually evolved to incorporate advancements in technology, and mechanical engineers today are pursuing developments in such fields as composites, mechatronics, and nanotechnology.

Task 15. Give the English equivalents to the following words and word combinations; make sentences with them:

галузь науки, основні принципи, медичні прилади, подальший вплив, мати справу з, стародавня Греція, навколишнє середовище, зброя, авіація, використання теплової енергії, транспортна система, постійно вдосконалюватися, досягнення в галузі технології, проводити розробки, нанотехнології, керування життєвим циклом виробів.

Task 16. Are the sentences true or false? Correct the false sentences:

1. Mechanics is connected with the behavior of mental bodies.
2. The principles of engineering are applied only in mechanical engineering.
3. Computer-aided engineering and product lifecycle management are used to buy and sell manufacturing plants.
4. The writings of Aristotle and Archimedes have no relation to the appearance of Mechanics.
5. Classical mechanics deals with the motion of and forces on objects.
6. Mechanical engineering is one of the newest and simplest engineering disciplines.

Task 17. Complete the following sentences using the information from the text:

1. Mechanical engineering applies the principles of ...
2. ... must understand core concepts including mechanics, kinematics, structural analysis, and electricity.
3. Mechanical engineering involves the production of ...
4. Classical mechanics was founded by ...
5. ... is the branch of science concerned with the behavior of ... when subjected to forces or displacements.
6. Mechanics has its origin in … .

Task 18. Answer the following questions to discuss the topic "The Science of Mechanics":

1. What's the origin of mechanics?

2. What are the main definitions of mechanics?

3. Who laid the foundation for classical mechanics?

4. What's the oldest and broadest engineering discipline?

5. What do mechanical engineers use to design and analyze manufacturing plants?

6. When did mechanical engineering emerge as a field?

7. What science appeared as a result of developments in the field of physics?

8. In what fields are mechanical engineers pursuing developments?

Task 19. Match each word in the column A with its synonym from the column B.

A	B
1. effect	a. movement
2. scientific	b. beginning
3. origin	c. to use
4. foundation	d. impact
5. motion	e. manufacturing
6. to apply	f. instrument
7. tool	g. basis
8. production	h. research

Task 20. Translate the text and: a) make a plan covering the main ideas of the text; b) put questions and let your group-mates answer them.

Classical Mechanics

In physics, classical mechanics and quantum mechanics are the two major sub-fields of mechanics. Classical mechanics is concerned with the set of physical laws describing the motion of bodies under the action of a system of forces. The study of the motion of bodies is an ancient one, making classical mechanics one of the oldest and largest subjects in science, engineering and technology. It is also widely known as Newtonian mechanics.

Classical mechanics describes the motion of macroscopic objects, from projectiles to parts of machinery, as well as astronomical objects, such as spacecraft, planets, stars, and galaxies. Besides this, many specializations within the subject deal with solids, liquids and gases and

other specific sub-topics. Classical mechanics also provides extremely accurate results as long as the domain of study is restricted to large objects and the speeds involved do not approach the speed of light.

When the objects being dealt with become sufficiently small, it becomes necessary to introduce the other major sub-field of mechanics, quantum mechanics, which reconciles the macroscopic laws of physics with the atomic nature of matter and handles the wave-particle duality of atoms and molecules. However, when both quantum mechanics and classical mechanics cannot apply such as at the quantum level with many degrees of freedom, quantum field theory (QFT) becomes applicable.

To deal with large degrees of freedom at the macroscopic level, statistical mechanics becomes valid. Statistical mechanics explores the large number of particles and their interactions as a whole in everyday life. Statistical mechanics is mainly used in thermodynamics. In the case of high velocity objects approaching the speed of light, classical mechanics is enhanced by special relativity. General relativity unifies special relativity with Newton's law of universal gravitation, allowing physicists to handle gravitation at a deeper level.

Task 21. Choose the variant that best completes the sentence.

1) Quantum mechanics becomes necessary when the objects being dealt with are sufficiently … .

a) large; b) small; c) average;

2) Classical mechanics is also known as … mechanics.

a) Greek; b) Galilleo; c) Newtonian;

3) … mechanics and classical mechanics are the two major sub-fields of mechanics.

a) quantum; b) classical; c) statistical;

4) The domain of study in classical mechanics is restricted to … .

a) small objects; b) large objects; c) huge objects;

5) … mechanics explores the large number of particles and their interactions as a whole in everyday life.

a) classical; b) statistical; c) quantum;

6) … handle gravitation at a deeper level in the result of unification of special relativity with Newton's law of universal gravitation.

a) mechanics; b) physicists; c) electricians;

7) … becomes applicable if both quantum mechanics and classical mechanics cannot be applied.

a) quantum field theory; b) statistical mechanics; c) thermodynamics.

Task 22. Substitute the definitions with the notions in the box. Translate the sentences into Ukrainian.

electricity; force; particle; physics; science; machinery; engineering; mechanics;

1. _____ The branch of science concerned with the behavior of physical bodies when subjected to forces or displacements.
2. _____ A small localized object to which can be ascribed several physical or chemical properties such as volume or mass.
3. _____ The set of physical phenomena associated with the presence and flow of electric charge.
4. _____ Any external effort that causes an object to undergo a certain change, either concerning its movement, direction, or geometrical construction.
5. _____ Natural science that involves the study of matter and its motion through space and time.
6. _____ Machines or machine parts considered as a group.
7. _____ Knowledge about or study of the natural world based on facts learned through experiments and observation.
8. _____ The work of designing and creating large structures (such as roads and bridges) by using scientific methods.

Task 23. Translate the following sentences into English.

1. Механіка була започаткована у Стародавній Греції.
2. Відомі науковці, а саме Галілей, Кеплер та Ньютон заклали фундамент науки, нині відомої як класична механіка.
3. Машинобудування – це дисципліна, що застосовує принципи інженерної справи, фізики, а також матеріалознавства.
4. Це галузь інженерної справи, що включає в себе виробництво та використання теплової та механічної потужності для розробки та виробництва машин та інструментів.
5. Галузь інженерної справи вимагає розуміння ключових концепцій, включаючи механіку, кінематику, термодинаміку, матеріалознавство, структурний аналіз та електрику.

Task 24. Complete the text using the words from the box.

mechanical; practitioner; examines; father; laws; applied; bodies; branch; application; fluids;

Applied mechanics is a … of the physical sciences and the practical application of mechanics. It … the response of bodies (solids and …) or systems of … to external forces. A … of the discipline is known as a mechanician.

… mechanics is used in many fields of engineering, especially mechanical … . Much of modern engineering mechanics is based on Isaac Newton's … of motion while the modern practice of their … can be traced back to Stephen Timoshenko, who is said to be the … of modern engineering mechanics.

Task 25. a) Match the words to make phrases.
b) Use the word combinations in your own sentences.
c) Make a dialogue using both phrases and sentences.

1. physical	a. power
2. scientific	b. developments
3. applies	c. bodies
4. mechanical	d. with
5. industrial	e. field
6. pursuing	f. principles
7. concerned	g. discipline
8. engineering	h. equipment

Task 26. Discuss with you group-mate(s):

- *What's the Difference between Engineering Mechanics and Mechanical Engineering?*