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**LAND  
TRANSPORT  
AND TECHNOLOGICAL  
MACHINES**

**НАЗЕМНЫЕ  
ТРАНСПОРТНЫЕ  
И ТЕХНОЛОГИЧЕСКИЕ  
МАШИНЫ**



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Учебное пособие состоит из 3 разделов, которые содержат аутентичные зарубежные тексты по профилю специальности, и комплекса коммуникативных упражнений и заданий.

Учебное пособие способствует получению необходимых знаний и формированию практических навыков для чтения и перевода литературы по специальности, а также развитию навыков устной речи с учетом потребностей в профессиональной сфере.

Пособие предназначено для студентов 2-го курса механико-технологического факультета по направлению подготовки специалистов «Наземно-транспортно-технологические средства» и по направлению подготовки бакалавров «Наземные транспортно-технологические комплексы».

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## INTRODUCTION. MECHANICAL ENGINEERING

### *Words to be remembered:*

**advancement** – успех; прогресс; продвижение

**application** – применение; употребление

**automotive engineering** – автостроение; автомобильная техника

**both ... and** – как...так и

**camshaft** – распредвал

**continually** – непрерывно; постоянно

**core** – суть; сущность

**crankshaft** – коленчатый вал

**define** – определять; устанавливать; характеризовать

**design** – конструировать; проектировать

**device** – устройство; механизм; приспособление

**efficiency** – эффективность; уровень качества

**emerge** – появляться; возникать

**engineering** – инженерное дело; конструирование; машиностроение

**equipment** – оборудование

**evolve** – развиваться

**handle** – управлять

**incorporate** – соединять; объединять

**involve** – включать в себя

**machinery** – механическое оборудование; машинное оборудование

**maintenance** – обслуживание

**manufacture** – производить

**mechanical engineer** – инженер-механик; машиностроитель; инженер по механическому оборудованию

**operation** – работа; эксплуатация

**overlap** – частично совпадать

**particular** – определенный; специфический

**precision** – точность

**produce** – *производить*

**pursue** – *продолжать*

**reduce** – *уменьшать; сокращать; снижать*

**refer (to)** – *касаться; относиться*

**repair** – *ремонт*

**require** – *требовать; нуждаться*

**separate** – *(v) отделять; (a) отдельный*

**trace back** – *прослеживать; восходить к*

### ***Task 1. Read and translate the text.***

#### **Text 1. Mechanical Engineering**

Engineering is defined as 1) the practical application of scientific knowledge in designing, building and control of machines, apparatus, roads, bridges and chemicals, and 2) the science, the work or a profession of an engineer.

Mechanical engineering is the discipline that applies the principles of engineering, physics, and materials science for the design, analysis, manufacturing, and maintenance of mechanical systems. It is the branch of engineering that involves the design, production, and operation of machinery. It is one of the oldest and broadest of the engineering disciplines. Mechanical engineers require an understanding of core concepts including mechanics, kinematics, thermodynamics, materials science, structural analysis, and electricity. They use these core principles to design and analyze manufacturing plants, industrial equipment and machinery, heating and cooling systems, transport systems, aircraft, watercraft, robotics, medical devices, weapons, and others. Some mechanical engineers specialize in particular types of machines such as pumps or steam turbines. A mechanical engineer designs not only the machines that make products but the products themselves, and must design for both economy and efficiency. A typical example of modern mechanical engineering is the design of a car or an agricultural

machine. One of the subtypes of mechanical engineering is automotive engineering.

Mechanical engineering emerged as a field during the industrial revolution in Europe in the 18<sup>th</sup> century. Its efficiency, however, can be traced back several thousand years around the world.

Mechanical engineering science emerged in the 19<sup>th</sup> century as a result of developments in the field of physics. The field of mechanical engineering continually evolved to incorporate advancements in technology, and mechanical engineers today are pursuing development in such fields as composites, mechatronics, and nanotechnology. It overlaps with aerospace engineering, metallurgical engineering, civil engineering, electrical engineering, manufacturing engineering, chemical engineering, and other engineering disciplines. Mechanical engineers may also work in the field of biomedical engineering, specifically with biomechanics, transport phenomena, biomechatronics, bionanotechnology, and modeling of biological systems.

## EXERCISES

*Ex. 1. Read the text and match the words with their definition.*

Words	Definition
1) physics	a) the quality of doing something well without making mistakes or wasting time, money and energy
2) equipment	b) the scientific study of physical objects, substances or natural forces such as light, sound, heat, electricity, pressure, etc.
3) maintenance	c) the practical use of something
4) efficiency	d) the process of producing something in large quantities using machines
5) design	e) the most important idea or principle
6) manufacturing	f) consisting of different parts or materials
7) composites	
8) machinery	
9) core concept	
10) transport system	
11) application	

Words	Definition
	g) repair, painting, etc. that are necessary to keep something in good condition h) a system of vehicles or method for carrying passengers or goods i) the way in which something is planned and made or arranged j) machines in general, especially large ones k) the tools, machines that are needed to do a particular job or activity

**Ex. 2. Insert the necessary prepositions if it is necessary.**

1. Engineering is defined as the science, the work or a profession ... an engineer.
2. Mechanical engineering applies the principles of engineering, physics, and materials science ... the design of mechanical systems.
3. Engineering is the practical application of scientific knowledge ... designing, building and control of machines and apparatus.
4. Industrial revolution took place in Europe ... the 18<sup>th</sup> century.
5. My brother specializes ... computer techniques.
6. After graduating ... the university a mechanic may work in different branches of national economy.

**Ex. 3. Complete the sentences with the given words in the necessary form.**

trace back    specialize    require    core    involve    branch
--

1. Mechanical engineers ... profound knowledge in mechanics, kinematics, thermodynamics, materials science, structural analysis, and electricity.



2. This company ... in the production of different types of mechanical equipment.
3. Automotive engineering is the ... of mechanical engineering.
4. Mechanical engineering is the branch that ... the design, production, and operation of machinery.
5. They use ... principles to design and analyze transport systems.
6. The development of mechanics can be ... several centuries.

**Ex. 4. Substitute the italic words with their synonyms from the text.**

1. Mechanical engineering *appeared* as a field in Europe in the 18<sup>th</sup> century.
2. The *evolution* of mechanical engineering can be traced back several thousand years around the world.
3. Mechanical engineering *uses* the principles of engineering, physics, and materials science.
4. These companies *produce* different types of industrial equipment and machinery.
5. The profession of a mechanic *calls for* a profound knowledge of mechanics, kinematics, thermodynamics, materials science, structural analysis, and electricity.
6. Any machine should be given a regular *technical assistance*.

**Ex. 5. Complete the sentences.**

1. Mechanical engineering is the branch of engineering that ... .
2. A typical example of modern mechanical engineering is ... .
3. Mechanical engineers may work in the field of ... .
4. Mechanical engineers may work in the field of ... .
5. One of the oldest and broadest of the engineering disciplines is ... .
6. Engineering is the practical application of ... .

**Ex. 6. Answer the following questions:**

1. How can engineering be defined?
2. What types of engineering do you know?

3. What does mechanical engineering involve?
4. What knowledge does a mechanical engineer require?
5. Why do mechanical engineers use such principles as heat, force and energy?
6. What stimulated mechanical engineering to become a separate field of engineering?
7. Why did mechanical engineering science emerge in the 19<sup>th</sup> century?
8. What other fields does mechanical engineering overlap with?

***Task 2. Read and translate the text.***

### **Text 2. History of Mechanical Engineering**

Mechanical engineering found its application in various ancient and medieval societies. The works of Archimedes (287–212 BC) deeply influenced mechanics in the Western traditions. The idea of the first steam engine, a seismometer, a chariot with differential gears and the world's first known endless power-transmitting chain drive appeared in the period of 10–265 AD. During the years from 7<sup>th</sup> to 15<sup>th</sup> centuries there were remarkable contributions from Muslim inventors in the field of mechanical technology. Many mechanical designs which now form the very basic of mechanisms, such as the crankshaft and camshaft were presented at that time.

Important breakthroughs in the foundations of mechanical engineering occurred in England during the 17<sup>th</sup> century when Sir Isaac Newton formulated the three Newton's Laws of Motion and developed Calculus, the mathematical basis of physics.

During the early 19<sup>th</sup> century in England, Germany and Scotland, the development of machine tools led mechanical engineering to become as a separate field within engineering. The first British professional society of mechanical engineers was formed in 1847.

In the United States, the American Society of Mechanical Engineers (ASME) was formed in 1880. The first schools in the

United States to offer an engineering education were the United States Military Academy in 1817, an institution now known as Norwich University in 1819, and Rensselaer Polytechnic Institute in 1825. Education in mechanical engineering has historically been based on a strong foundation in mathematics and science.

***Task 3. Read text 2 and make a list of inventions that led mechanical engineering to develop as a separate field within engineering.***

***Task 4. Find information about mechanical terms appeared in previous centuries in the text.***

***Task 5. Make a short summary of text 2.***

***Task 6. Read and translate the text.***

### **Text 3. Training of Mechanical Engineers Abroad**

Degrees in mechanical engineering are offered at various universities worldwide. In Brazil, Ireland, Philippines, Pakistan, China, Greece, Turkey, North America, South Asia, Nepal, India, Dominican Republic and the United Kingdom, mechanical engineering programs typically take four to five years of studies. They result in Bachelor of Engineering (B.Eng. or B.E.), Bachelor of Science (B.Sc. or B.S.), Bachelor of Science Engineering (B.Sc.Eng.), Bachelor of Technology (B.Tech.), Bachelor of Mechanical Engineering (B.M.E.), or Bachelor of Applied Science (B.A.Sc.) degree. In Spain, Portugal and most of South America the formal name for the degree is "Mechanical Engineer". The course work is based on five or six years of training. In Italy and Greece it is based on five years of training, but a student has to pass a state exam at the end of the course in Italy. In Australia, mechanical engineering degrees are awarded as Bachelor of Engineering (Mechanical) and there are an increasing number of

specializations. The degree takes four years of full-time studies. Before the degree can be awarded, the student must complete at least 3 months of the job work experience in an engineering firm. Similar systems are also present in South Africa. In the United States, most mechanical engineering programs are accredited by the Accreditation Board for Engineering and Technology (ABET) to ensure similar course requirements and standards among universities. Mechanical engineering programs in Canada are accredited by the Canadian Engineering Accreditation Board (CEAB).

Some mechanical engineers go on to take a postgraduate degree such as a Master of Engineering, Master of Technology, Master of Science, Master of Engineering Management (M.Eng.Mgt. or M.E.M.), a Doctor of Philosophy in engineering (Eng.D. or Ph.D.) or an Engineer's degree. The master's and engineer's degrees may or may not include research. The Engineer's degree exists at a few institutions at an intermediate level between the master's degree and the doctorate.

## EXERCISES

***Ex. 1. Match the names of degrees with the names of the countries where they can be awarded.***

Names of countries	Names of degrees
Pakistan	Bachelor of Science
South America	Bachelor of Engineering
Spain	Bachelor of Mechanical Engineering
the United States	Master of Engineering
the United Kingdom	Bachelor of Technology
Australia	Bachelor of Applied Science
Ireland	Mechanical Engineer
Portugal	Bachelor of Engineering (Mechanical)
South Africa	Bachelor of Science Engineering

***Ex. 2. Speak about the postgraduate degrees that can be done in the field of Mechanical Engineering according to the plan.***

- 1) the name of the degree;
- 2) the period of training;
- 3) the sphere of interest.

***Task 7. Read and translate the text.***

#### **Text 4. Automation and Robotics**

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

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. 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.

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 computer-controlled 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.

### EXERCISES

*Ex. 1. Read the text and match the words with their definition.*

Words	Definition
1) manufacturing	a) the time between the design of a product and its production
2) information technologies	b) jobs in communications, energy industry, transport, hospitals, etc.
3) goods	c) a set of tasks performed to complete a procedure
4) handling	d) the process of packing and distributing goods
5) skilled	e) the industry in which machinery is used to produce goods
6) workflow	f) having the knowledge and the ability to do something well
7) unemployment	g) things that are made to be sold
8) lead time	h) the state of not having a job
9) service jobs	i) the development and application of computer systems

**Ex. 2. Read the following statements and fill up the table.**

Advantages	Disadvantages
1. Speeding up the process of society development.	1. Unpredictable costs due to research and development.
2. ...	2. ...

1. Sharp increase in unemployment rate.
2. Disastrous effects on the environment.
3. Replacing operators in tasks that involve monotonous work.
4. Higher reliability and precision in performing tasks.
5. Economy improvement and higher productivity.
6. Replacing operators in tasks done in dangerous environments.
7. A high initial cost as automation requires a large initial investment.

**Ex. 3. Think of what robots can do and tick the possible actions.**

control the production	handle dangerous materials
go underwater	easily walk on two legs
speak fluently	smell things
taste food	see obstacles
go to space	play musical instruments
drive a car	take photos

### **Control Vocabulary to Introduction**

- 1) define; 2) advancement; 3) continually; 4) manufacture; 5) overlap; 6) mechanical engineer; 7) equipment; 8) engineering; 9) trace back; 10) maintenance; 11) efficiency; 12) evolve; 13) core; 14) incorporate; 15) camshaft; 16) produce; 17) machinery; 18.) crankshaft; 19) pursue; 20) application; 21) both ... and; 22) automotive; 23) precision; 24) involve; 25) operation; 26) particular; 27) refer (to); 28) emerge; 29) repair; 30) design; 31) device; 32) handle; 33) reduce; 34) require; 35) separate.

## PART I. TRANSPORT VEHICLES

### SECTION 1. AUTOMOBILES

#### Unit 1. History of Cars

##### *Words to be remembered:*

**assemble** – *монтировать; собирать*

**brakes** – *тормоза*

**clutch** – *сцепление*

**consider** – *считать; полагать*

**dashboard** – *щиток приборной панели*

**engine** – *двигатель; мотор; машина*

**frame** – *рама; каркас; корпус*

**framework** – *каркас*

**fuel** – *(n) топливо; (v) заправлять(ся) горючим; питать топливом*

**gasoline** – *бензин*

**gearbox** – *коробка передач; редуктор*

**give credit** – *приписывать (кому-либо)*

**horsepower** – *л. с. (лошадиная сила)*

**hydraulic** – *гидравлический*

**ignition system** – *система зажигания*

**inbuilt** – *встроенный*

**invent** – *изобретать; делать открытие; выдумывать*

**layout** – *компоновка; схема; план*

**means** – *средства; материальные возможности; способ*

**mechanic** – *механик; оператор; машинист; техник*

**piston** – *поршень*

**power** – *приводить в действие*

**power steering** – *усилитель руля*

**propel** – *приводить в движение*

**propulsion** – *движение*

**push** – *толчок; толкать*



**reflect** – *отражать*

**roller** – *ролик; валик; валец; каток; вал*

**scale** – *масштаб; размер; шкала*

**seat belt** – *ремень безопасности*

**shift** – *сдвиг*

**specify** – *точно отражать*

**speed** – *скорость*

**suspension** – *подвеска*

**tempered glass** – *закаленное стекло*

**tiller** – *рукоятка; рычаг*

**torque** – *крутящий момент*

**transmission** – *передаточный механизм коробки передач; коробка передач*

**vehicle** – *транспортное средство*

**wheel** – *колесо*

**Task 1. Read and translate the text.**

### **Text 1. The Origin of an Automobile**

The word “automobile” is a classical compound derived from the Ancient Greek word *autós* meaning “*self*”, and the Latin word *mobilis*, meaning “*movable*”. Thus an automobile means a self-moving vehicle. It entered the English language from French, and was first adopted by the Automobile Club of Great Britain in 1897. The synonyms of automobile are: auto, car, auto-car, motor car.

The word “car” is believed to originate from the Latin word *carrus* or *carrum* (“*wheeled vehicle*”), or the Middle English word *carre* meaning “*cart*” in Old North French. It originally referred to any wheeled horse-drawn vehicle, such as a cart, carriage, or wagon.

Over time, the word “automobile” was replaced by “motor car”. Motor car is attested from 1895, and is the usual formal name for cars in British English. The term “horseless carriage” was used by some to refer to the first cars at the time that they were being built,

and is attested from 1895. An abbreviated form, “auto” is now considered as old-fashioned. The word is still used in some compound formations in American English, like “auto industry” and “auto mechanic”.

English and American dictionaries give a number of definitions of an automobile:

- a) any wheeled vehicle;
- b) a (road) vehicle with four wheels that can carry a small number of people;
- c) a wheeled motor vehicle used for transporting passengers, which also carries its own engine;
- d) a motorized vehicle that consists of 4 wheels, and is powered by an inbuilt engine;
- e) a passenger vehicle that is designed for operations on roads and usually having 4 wheels and a diesel or gasoline internal-combustion engine.

Most definitions of the term specify that automobiles are designed to run primarily on roads, to have seating for one to six people, typically have four wheels and be constructed principally for the transport of people rather than goods. Many types of vehicles do similar tasks. Automobiles generally use gasoline to fuel, but technological advances have led to the design of cars that can run on electricity and even water.

The history of an automobile is very rich and dates back to the 15<sup>th</sup> century. It was not invented in a single day by a single inventor. The history of an automobile reflects the evolution that took place worldwide. It is estimated that over 100,000 patents created the modern automobile. However, we can point to the many firsts that occurred along the way. The first theoretical plans, designs and models for transport vehicles were drawn up by both Leonardo da Vinci and Isaac Newton.

The first model of steam-powered vehicle was designed by Ferdinand Verbiest, a member of a Jesuit mission, in China around 1672. It was a 65-cm-long scale-model toy for the Chinese Emperor

that was unable to carry a driver or a passenger. It is not known if this vehicle of small enough scale was ever built.

In 1769, the very first self-propelled road vehicle was invented by French engineer and mechanic, Nicolas Joseph Cugnot who used a steam engine to power his vehicle.

There are many different types of automobiles – steam, electric, and gasoline – as well as countless styles. Who invented the automobile is a matter of opinion. If we had to give credit to one inventor, it would probably be Karl Benz from Germany. Many people suggest that he created the first true automobile in 1885–1886.

## EXERCISES

*Ex. 1. Find the following English equivalents in the text:*

для людей, а не для товаров; считается устаревшим; множество определений; самодвижущееся транспортное средство; любой колесный автомобиль на конной тяге; сокращенная форма; моторизованное транспортное средство; приводится в движение; встроенный двигатель; работать на электричестве; история автомобиля восходит к; модели транспортных средств были составлены; игрушечная модель шестидесяти пяти сантиметров; приводить транспортное средство в движение; спорный вопрос; отдать предпочтение.

*Ex. 2. Insert the necessary prepositions.*

1. A lot of our up-to-date inventions originated ... the models suggested in Ancient and Medieval Times.
2. Mechanical engineering science dates back ... the 19<sup>th</sup> century as a result of developments in the field of physics.
3. The word “a car” entered ... the English language from Latin.
4. They gave all the credit for success of the project ... both architects.

5. It is a full time course consisting ... six different modules.
6. Research points ... the connection between these two phenomena.
7. We have been friends for a number ... years.
7. These automobiles are able to run both ... petrol and electricity.

**Ex. 3. Read text 1 and match the words with their definitions.**

<b>Words</b>	<b>Definition</b>
1) vehicle	a) someone who is skilled at repairing motor vehicles and machinery
2) passenger	b) someone who is travelling but not driving
3) movable	c) a part of a vehicle that produces power to make it move
4) invent	d) hot mist that water produces when it is boiled
5) engine	e) a machine with an engine that is used to take people or things from one place to another
6) wheel	f) not fixed in one place or position
7) mechanic	g) one of the round things under a car, a bus, a train, etc. that turns when it moves
8) steam	h) to make, to design or to think of a new type of a thing

**Ex. 4. Complete the sentences.**

1. Over time, the word “automobile” was replaced ... .
2. Most definitions of the term specify that ... .
3. The history of an automobile dates back to ... .
4. Who invented the automobile is ... .
5. The first theoretical designs and models for transport vehicles were drawn up by ... .
6. The very first self-propelled road vehicle was invented by ... .

7. The first model of steam-powered vehicle designed in China was unable... .

**Ex. 5. Compile words and word combinations from A with words from B. Give the translation of newly formed combinations.**

A	B
passenger	vehicle
motorized	engine
self-moving	electricity
wheeled motor	automobile
steam	water
run on	advances
transport	
self-propelled	
inbuilt	
gasoline	
steam-powered	
internal combustion	
technological	
wheeled	

**Ex. 6. Insert the words from the box into the sentences.**

inbuilt   scale   specify   steam-powered   vehicle runs   gasoline  
 originated   dates back   a number of

1. The first model of ... was created by F. Verbiest.
2. The history of an automobile ... to the 15<sup>th</sup> century.
3. This car ... both on electricity and on gasoline.
4. Most definitions of a car ... that they were made for people's transportation and running on roads.

5. The word “car” ... from two ancient words.
6. The model of this device is of small ... .
7. English dictionaries give ... definitions of these phenomena.
8. This vehicle has only three wheels and is powered by ... engine.
9. They use ... to fuel their car.

**Ex. 7. Look through the text and find out whether (if) the following sentences are false or true. Begin your answers using the phrases:**

a) I think..., I suppose..., to my mind..., if I’m not mistaken...;

+

b) it’s correct..., it’s wrong..., it’s false..., it’s true.

1. The word “an automobile” is believed to originate from the Old North French word.
2. An abbreviated form “auto” is now widely used in the world.
3. The first steam-powered vehicle was designed in the 17<sup>th</sup> century.
4. The history of the automobile reflects an evolution that has taken since 15<sup>th</sup> century.
5. The only fuel used by automobiles is gasoline.
6. The credit of inventing automobiles is given to China.
7. An automobile was invented in a single day by a single inventor.

**Task 2. Speak on:**

- 1) the most precise definition of an automobile from the suggested in text 1;
- 2) the difference between an automobile and a vehicle;
- 3) the origin of the word “automobile”;
- 4) the person you consider to be the inventor of a car;
- 5) the possible usage of cars nowadays.

### ***Task 3. Read and translate the text.***

#### **Text 2. The Invention of First Automobiles**

Many people in many nations contributed the ideas, inventions and innovations required to assemble useful motor vehicle.

One of the earliest attempts to propel a vehicle by mechanical power was suggested by Isaac Newton. But the first self-propelled vehicle capable of human transportation was built by the French military engineer Cugnot in 1763. In 1769 he built the first functioning full-scale steam-driven mechanical vehicle or car which had three wheels, carried two passengers and ran at maximum speed of four miles per hour. The steam engine and boiler were separated from the rest of the vehicle and placed in the front. Steam engines powered cars by burning fuel that heated water in a boiler creating steam. It expanded and pushed pistons that turned the crankshaft, which then turned the wheels. The vehicle had to stop every ten to fifteen minutes to build up steam power.

In 1770 Cugnot built a steam-powered tricycle that carried four passengers. Steam engines added so much weight to a poor design for road vehicles.



In the year of 1771 Cugnot drove one of his road vehicles into a stone wall making him the first man to get into a motor vehicle accident. As Cugnot's design proved to be impractical, his invention was not developed in his native France.

After Cugnot several other inventors designed steam-powered road vehicles. Historians, who accept that early steam-powered road vehicles were automobiles, consider Nicolas Cugnot to be the inventor of the first automobile.

At the beginning of the 19<sup>th</sup> century the center of innovation shift-ed to Great Britain. In 1801 Richard Trevithick was running