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«Вологодский государственный университет»

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Английский язык
Mechanical Engineering

Методические указания и учебные задания для курса «Основы технического перевода» для 3 курса специальностей «Технология машиностроения» и «Монтаж и эксплуатация технологического оборудования»
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Методические указания разработаны на основе Федерального государственного образовательного стандарта (ФГОС) СПО по специальностям: 15.02.08 «Технология машиностроения», 15.02.01 «Монтаж и эксплуатация технологического оборудования (по отраслям)» и адресованы студентам очной формы обучения.

Утверждено редакционно-издательским отделом ВоГУ

Составитель: Ю.В. Сарапульцева, преподаватель иностранных языков МТ 1 категории

Рецензент: С.Н. Богданова, преподаватель иностранных языков МТ 1 категории

Предисловие

Настоящие методические указания предназначены для использования в учебном процессе для студентов III курса, обучающимся по специальностям 15.02.01 "Монтаж и эксплуатация технологического оборудования" и 15.02.08 "Технология машиностроения" и содержат задания для практических и самостоятельных работ.

Методические указания написаны на основе рабочей программы по учебной дисциплине «Английский язык», которая соответствует Федеральному государственному образовательному стандарту.

Цель методических указаний - подготовить студентов к чтению научно-технической литературы по специальности. Тематика текстов, заимствованных из оригинальных источников, связана с основными вопросами указанных специальностей. Задания к текстам предусматривают как подготовку к основным, задействованным в данной сфере, видам чтения (изучающее, ознакомительное, просмотровое, поисковое чтение), так и дальнейшее формирование лексико-грамматических навыков студентов. Овладение технологиями чтения осуществляется в результате выполнения предтекстовых, текстовых и послетекстовых заданий. В данных указаниях также представлен перечень заданий для самостоятельной работы студентов, которая развивает творческое мышление, умение пользоваться справочной литературой, помогает осмыслению изученного материала, стимулирует приобретение дополнительных специальных знаний и применение полученных знаний на практике. Различные по сложности задания позволяют сформировать УУД, требуемые федеральным государственным стандартом (ФГОС). Степень проработки того или иного текста определяется преподавателем в соответствии с целями и уровнем подготовленности группы. Задания, связанные с INTERNET, носят рекомендательный характер.

В конце методических указаний помещен библиографический список.

Входная диагностика в форме теста.

Mechanical Engineering: Engineering Materials

1. Specify the sequence correctly

A. Grain growth, recrystallisation, stress relief

B. Stress relief, grain growth, recrystallisation

C. Stress relief, recrystallisation, grain growth

D. Grain growth, stress relief, recrystallization

2. Thermoplastic materials are those materials which

A. are formed into shape under heat and pressure and results in a permanently hard product

B. do not become hard with the application of heat and pressure and no chemical change occurs

C. are flexible and can withstand considerable wear under suitable conditions

D. are used as a friction lining for clutches and brakes

3. Which of the following material has maximum ductility?

A. Mild steel

B. Copper

C. Nickel

D. Aluminium

4. An eutectoid steel consists of

A. wholly pearlite

B. wholly austenite

C. pearlite and ferrite

D. pearlite and cementite

5. Shock resisting steels should have

A. low wear resistance

B. low hardness

C. low tensile strength

D. toughness

6. Cast iron is

A. ductile material

B. malleable material

C. brittle material

D. tough material

7. The hardness is the property of a material due to which it

A. can be drawn into wires

B. breaks with little permanent distortion

C. can cut another metal

D. can be rolled or hammered into thin sheets

8. Malleable cast iron is produced

A. by adding magnesium to molten cast iron

B. by quick cooling of molten cast iron

C. from white cast iron by annealing process

D. none of these

9. Smelting is the process of

A. removing the impurities like clay, sand etc. from the iron ore by washing with water

B. expelling moisture, carbon dioxide, sulphur and arsenic from the iron ore by heating in shallow kilns

C. reducing the ore with carbon in the presence of a flux

D. all of the above

10. The ability of a material to absorb energy in the plastic range is called

A. resilience

B. creep

C. fatigue strength

D. toughness

11. Brass is an alloy of

A. copper and zinc

B. copper and tin

C. copper, tin and zinc

D. none of these

12. A material is said to be allotropic, if it has

A. fixed structure at all temperatures

B. atoms distributed in random pattern

C. different crystal structures at different temperatures

D. any one of the above

13. The hardness and tensile strength in austenitic stainless steel can be increased by

A. hardening and cold working
C. martempering
B. normalising
D. full annealing

14. An alloy steel which is work hardenable and which is used to make the blades of bulldozers, bucket wheel excavators and other earth moving equipment contain iron, carbon and

A. chromium B. silicon
C. manganese D. magnesium

15. Which of the following has a fine gold colour and is used for imitation jewellery?

A.
Silicon bronze
C. Gun metal
B. Aluminium bronze
D. Babbit metal

16. When the steel is normalised, its

A. yield point increases
B. ductility decreases
C. ultimate tensile strength increases
D. all of these

17. White cast iron has a high tensile strength and a low compressive strength.

A. Yes B. No

18. Crystal structure of a material is, generally, examined by

A. naked eye
C. metallurgical microscope
B. optical microscope
D. X-ray techniques

19. Iron ore is, usually, found in the form of

A. oxides
C. sulphides
B. carbonates
D. all of these

20. The hardness of steel increases if it contains

A. pearlite B. ferrite
C. cementite D. martensite

Шкала оценок

«отлично»	«хорошо»	«удовлетворительно»	«неудовлетворительно»
78 - 70	**69 - 54**	**53 - 38**	**37 и ниже**

Unit 1

1. **Лексические вопросы перевода терминов.**
2. **Работа с текстом.**

Lesson 1

The Theoretical Part

Перевод технических терминов.

Термин - это слово или словосочетание, которое может иметь отличное от обиходного значение в зависимости от области науки и техники, в которой оно употребляется. Термин может быть простым, состоящим из одного слова switch- «выключатель» и сложным термином словосочетанием automatic-switch «автоматический выключатель».

При переводе терминов поможет соблюдение следующих правил:

1. В специальном тексте каждое слово, даже очень хорошо знакомое, может оказаться термином. Так, в тексте по механике *no play is admitted* надо переводить не «играть нельзя», а «люфт не допускается»; *shoe* - «колодка» в описаний тормозной системы, для электропоезда - «лыжа токоприемника», для гусеницы - «звено»; *dead* - это «обесточенный» в электромеханике, «глухой», т.е. «несквозной» в машиностроении и строительстве, а когда речь идет о растворах, газе и т.п. - «использованный». Переводя специальную литературу, надо всегда помнить об этой многозначности.

Для перевода терминов необходимо сначала определить тематику контекста и уменьшить тем самым количество вариантов перевода многозначных слов.

При работе с терминами-словосочетаниями следует помнить, что основной компонент, как правило, стоит всегда в конце.

2. Пользуйтесь при переводе специальными техническими словарями. При многозначности слова следует брать то его значение, которое принадлежит соответствующей области техники.

Способы перевода терминов:

1) калькирование:

single-row engine - однорядный двигатель

2) перевод с помощью родительного падежа или с использованием предлога:

direct current system - система постоянного тока

data processing equipment- оборудование для обработки данных

3) перевод одного из членов словосочетании группой поясняющих слов:

high aluminium cement - цемент с большим содержанием глинозема

4) перевод с изменением порядка компонентов атрибутивной группы:

battery-charging generators - генераторы, подзаряжающие батареи

automobile repair plant construction project - проект строительства авторемонтного завода

Перевод многокомпонентных терминов осуществляется по следующей схеме:

Temperature(3) compensating(4) condenser(2) arrangements(1)

arrangements – устройства temperature - температура

condenser- конденсатор compensating- компенсация

temperature compensating- температурная компенсация

temperature compensating condenser - температурная компенсация конденсатора

temperature compensating condenser arrangements - устройство для температурной компенсации конденсатора

Транслитерация.

Метод транслитерации передача букв английского языка посредством букв русского языка находит широкое распространение в физике, химии, медицине, космонавтике.

Например: радар. голография, грейдер.

Создание новых терминов путем конверсии.

а) примеры превращения существительных в глаголы:

Существительное	Глагол	Новое значение
Doctor – врач	to doctor	ремонтировать

б) примеры превращения глаголов в существительные:

Глагол	Существительное	Новое значение
To throw away – выбросить	throwaway	бесплатная рекламная брошюра

Создание новых терминов при помощи префиксов и суффиксов.

а) префиксы

inter-: interaction взаимодействие

interface интерфейс, сопряжение

б) новые суффиксы -ry, -ship, -wise:

circuitry схемное решение, комплекс схем

workmanship мастерство. квалификация

percentagewise считая в процентах

Создание новых терминов при помощи словосложения.

motel - мотель (автомашина+гостиница) = motor+hotel;

escalator - эскалатор (поднимающий элеватор) = escalating elevator.

The Practical Part

1. Translate the compound terms. Remember to start from the last component.

Power consumption; power consumption change; signals manipulation; transistor invention; circuit functions; communication/systems, data processing system; integrated circuits development; science field; process control; automatization processes control; circuit components; size reduction; electronics development; communication means; problem solution; space exploration; pattern recognition; customers accounts; air traffic control.

2. Translate the compound terms:

Example: *air defense(3) guided(1) missile(2) - управляемая ракета противовоздушной обороны*

1) pulse-type radio altimeter
2) flight-path deviation indicator
3) pulse-type high-voltage power supply
4) radio-frequency high-voltage power supply
5) radio navigation land station
6) picture signal carrier wave
7) gas turbine power plant
8) climate-controlled office
9) video display terminals (VDTs)
10) age-old back problem

3. Translate the next pair of words. Define the parts of speech:

To hold back – holdback

To follow up – follow-up form – to form

To arrange –arrangement

Motor – to motor

To spin off – spinoff

Definition – to define

To separate – separation

Print – to print

4. **Write down the words, translate them and mark the affixes.**

obstruction	expand
substation	splitting
comprise	explosion
inductance	frequency
distribution	prognosticate

5. Choose the equivalent words from the second column.

fruitful	сделать опечатку
useless	невесомость
weightlessness	бесполезный
transistor	поглотитель
absorbent	преобразование
reopen	плодотворный
transformation	профилактический
misprint	открывать (заново)
proactive	передатчик

6. Make the phonetic analysis of the words:

Example: scope [skəup]-5 letters, 5 vowels

reopen

fruitful

mecanics

Lesson 2

1. Read and write down the marked words (the words combinations) from the text, learn them if they are new to you.

2. Find and read 5 words with suffixes.

3. Read the text:

Mechanics

Mechanics (Greek) is the branch of physics concerned with the behaviour of physical bodies when **subjected** to forces or displacements, and the **subsequent** effect of the bodies on their **environment.** A person working in the discipline is known as a mechanician.

Mechanics is the original discipline of physics. It is a huge body of knowledge about the natural world. It also **constitutes** a central pail of technology. That is how **to apply** this knowledge **for humanly defined purposes**. In this connection, the discipline is often known as engineering mechanics or applied mechanics.

Classical vs. Quantum

The major division of the mechanics discipline **separates** classical mechanics from quantum mechanics.

Historically, classical mechanics came first, while quantum mechanics is a comparatively recent invention. Classical mechanics is older than written history, while quantum mechanics didn't appear until 1900. Both commonly constitute the most **certain** knowledge that exists about physical nature. Classical mechanics has especially often been viewed as a model for other so-called exact sciences. **Essential** in this respect is the **relentless** use of mathematics in theories, as well as the decisive role played by experiment in generating and testing them.

Quantum mechanics is, formally at least, of **the widest scope**, and can be seen as **encompassing classical mechanics**, as a sub- discipline which applies under certain restricted **circumstances.** If properly interpreted, there is no **contradiction**, or conflict between the two subjects, each simply **pertains** to specific situations. While it is true that, historically, **quantum mechanics** has been seen as having **superseded** classical mechanics, this is only true on the hypothetical or foundational level. For practical problems, classical mechanics **is able to solve**

problems which are unmanageably difficult in quantum mechanics and **hence** remains useful and well used.

4. Finish the sentence:

1) Mechanics is a huge body of...
2) Mechanics is a branch of...
3) Mechanics constitutes ...
4) A mechanician is a person ...
5) Mechanics is also known as ...
6) Mechanics can be subdivided into ...
7) Classical mechanics is older than ...
8) Quantum mechanics is a comparatively ...
9) Each part of mechanics pertains ...
10) All mechanics potentially needs ...

5. Answer the questions:

1) What is mechanics?
2) Who is a mechanician?
3) What science is mechanics originally connected with?
4) What other names can mechanics have?
5) What is the major division of mechanics?
6) What knowledge does mechanics constitute?
7) What mechanics appeared first - classical or quantum?
8) When did quantum mechanics appear?
9) What is classical mechanics?
10) What does quantum mechanics deal with?

5. Translate from Russian into English:

1) Тела, подвергающиеся перемещению или воздействию сил, изучаются механикой.

2) Прикладная механика говорит о том, как применять знания физики для практических нужд человека.

3) И квантовая, и классическая механика содержат самые точные существующие данные о физической природе вещей.

4) В теориях классической механики всегда присутствует • математика, решающая роль принадлежит эксперименту.

5) В разных ситуациях квантовую механику можно рассматривать и как часть классической механики, и как включающее ее в себя знание.

6) На практике классическая механика способна решать невозможные для квантовой механики задачи.

6. Read the text and give the title. Try to translate it without the dictionary.

Analogous to the quantum vs. classical reformation, Einstein's general and special theories of relativity have expanded the scope of mechanics beyond the mechanics of Newton and Gallileo, and made small corrections to them. Relativistic corrections were also needed for quantum mechanics, although relativity is categorized as a classical theory.

There are no contradictions or conflicts between the two, so long as the specific circumstances are carefully kept in mind. Just as one could, in the loosest possible sense, characterize classical mechanics as dealing with "large" bodies (such as engine parts), and quantum mechanics with "small" ones (such as particles), it could be said that relativistic mechanics deals with "fast" bodies, and non- relativistic mechanics with "slow" ones. However, "fast" and "slow" are relative concepts, depending on the state of motion of the observer. This means that all mechanics, whether classical or quantum, potentially needs to be described relativistically. On the other hand, as an observer, one may frequently arrange the situation in such a way that this is not really required.

Unit 2

1. Перевод конструкций пассивного залога.

2. Работа с текстами.

Lesson 1

The Theoretical Part

Перевод конструкций пассивного залога.

1. Способы перевода глагола-сказуемого:

Глагол-сказуемое в страдательном залоге на русский язык переводится:

1) сочетанием глагола «быть» с краткой формой причастия страдательного залога. Глагол «быть» в настоящем времени не переводится.

Например: The plan is fulfilled in time. – План выполнен вовремя.

2) глаголом, оканчивающимся на -сь, -ся.

Например: The liquid fuel is gradually injected into the cylinder. – Жидкое топливо постепенно впрыскивается в цилиндр.

3) неопределенно-личной формой глагола в действительном залоге в третьем лице множественного числа (при отсутствии действующего лица).

Например: Our scientists are given the widest opportunities for research work.- Нашим ученым предоставляют самые широкие возможности для научно-исследовательской работы.

4) личной формой глагола в действительном залоге только при наличии дополнения с предлогом by, причем дополнение с предлогом by часто переводится на русский язык подлежащим. Например: America was discovered by Columbus. – Колумб открыл Америку. I was helped by my friend. – Мой друг помог мне.

2. Способы перевода подлежащего:

Подлежащее английского предложения со сказуемым в страдательном залоге на русский язык переводится:

1) существительным (или местоимением) в именительном или винительном падежах.

Например: The worker was sent to the head engineer. – Рабочий был отправлен к главному инженеру. (Рабочего отправили к главному инженеру.)

2) существительным (местоимением) в дательном падеже.

Например: We have been shown a new tool. – Нам показали новый резец.

3) если в английском предложении после сказуемого в страдательном залоге стоит предлог, относящийся к нему, то перевод такого предложения следует начинать с предлога, относя его к подлежащему, а сказуемое переводится неопределенно-личной формой глагола.

Например: This article is often referred to. – На эту статью часто ссылаются. This discovery is much spoken about. – Об этом открытии много говорят.

The Practical Part

1. Using the link, find information and brush up your knowledges about the Passive Voice (http://www.native-english.ru/grammar/passive-voice). Do the exercises, given at that page. (You may use the grammar guides and textbooks too).

2. Fill in the table with the tense forms, which are given below.

	Simple	**Progressive**	**Perfect**	**Perfect Progressive**
Present				
Past				
Future				

Was/ were as being asked, had been asked, have / has been asked, will be asked, would be asked, am / is / are asked, was \ were asked, am / is / are being asked, will have been asked, would have been asked

3. Change the sentence according to the example. Translate the obtained sentences.

Example: *A telephone call woke me up. – I was woken up by a telephone call.*

1. Beginners use that computer.
2. The moonlight lit everything in the room.
3. Don’t worry, we shall settle your problems.

4. The Semyonovs don’t use this room very often.

5. The secretary is still typing the letter.

6. Mum cut the meat and chopped it.

7. Snow covered everything.

8. The police have been looking for him for a month!

9. Our chief offered me a day- off.

10. He pointed out the mistake to me.

4. Translate the sentences. Underline the Passive Voice constructions.

1) This question was agreed upon after a prolonged discussion. 2) The composition of steel is affected by various ingredients. 3) This universal motor is adopted as being more economical. 4) It is a battery that supplies a potential difference for the circuit it is connected to. 5) We were informed about the report to be made by our professor at the meeting. 6) The museum building is being lined with concrete block segments of a new pattern. 7) Coated nylon has been used recently as the basic material in the construction of small craft. 8) The plant is being modified now to start mass production of the new houses. 9) I wish his project had been discussed in detail. 10) It was only a short time ago that textiles were used in motor-cars, aeroplanes and ships. 11) This question is referred to in this article.

5. Translate, define the structure of the sentence, name the parts of speech.

Developing businesses grow relatively slowly and are strongly connected with, if not owned by, local families.

The motion of a spacecraft is described by the relativistic theory of classical mechanics.

Lesson 2

1. Read the words. Find the meanings between the words which are given below. Check your work with the dictionary. Learn the words.

particle	fluid	to interweave
projectile	rigid	to derive
spacecraft	to retain	wave function
machinery	attitude	
solid	atomic nucleus	

Жидкий, жидкость, газ, газообразный; частица; снаряд; машины, оборудование, механизмы; твёрдое тело, твердый; атомное ядро; жесткий, твердый; сохранять, удерживать; пространственное положение; переплетаться; волновая функция; космический корабль, космический аппарат; получать, извлекать**.**

2. View the text. Try to guess what is it about. Give the title for the text.

3. Find the sentences which are beginning from the next phrases:

- Other distinctions between the various sub-disciplines of mechanics…
- These subjects have both…
- The motion of a spacecraft…
- In fact, in quantum mechanics…
- The following are two lists of various subjects…

4. Read and translate the text.

Thus the often-used term body needs to stand for a wide assortment of objects, including particles, projectiles, spacecraft, stars, parts of machinery, parts of solids, parts of fluids (gases and liquids), etc.

Other distinctions between the various sub-disciplines of mechanics concern the nature of the bodies being described. Particles are bodies with little (known) internal structure, treated as mathematical points in classical mechanics. Rigid bodies have size and shape, but retain simplicity close to that of the particle, adding just a few so-called degrees of freedom, such as orientation in space.

Otherwise, bodies may be semi-rigid, i.e. elastic, or non- rigid, i.e. fluid. These subjects have both classical and quantum divisions of study.

For instance: The motion of a spacecraft, regarding its orbit and attitude (rotation), is described by the relativistic theory of classical mechanics. While analogous motions of an atomic nucleus are described by quantum mechanics.

Sub-disciplines in mechanics

The following are two lists of various subjects that are studied in mechanics. Note that there is also the "theory of fields" which constitutes a separate discipline in physics, formally treated as distinct from mechanics, whether classical fields or quantum fields. But in actual practice, subjects belonging to mechanics and fields are closely interwoven. Thus, for instance, forces that act on particles are frequently derived from fields (electromagnetic or gravitational), and particles generate

fields by acting as sources. In fact, in quantum mechanics, particles themselves are fields, as described theoretically by the wave function.

5. Answer the questions:

1) What are the meanings of the term body?
2) What is a fluid?
3) What is a particle?
4) What have rigid bodies?
5) What does it mean to be semi- rigid?
6) Are analogous motions of an atomic nucleus described by quantum mechanics?
7) What can you say about sub-disciplines in mechanics?
8) What is the "theory of fields"?
9) How does quantum mechanics describe particles?

6. Translate the words paying attention to the meanings of the prefixes dis-, in-, un-, non-, ir-:

Dis-: disadvantage; disconnect; disappear; disclose; discomfort; discontinue; discount; discredit; discriminate; disintegrate.

in-: invisible; inaccurate; inactive; incapable; incompact;

insignificant; inhuman; informal; ineffective; indifferent; indecisive; inconsumable; incorrect.

un-: uncontrollable; unbelievable; unable; unchanged;

uncomfortable; uncommunicative; undisciplined; unexpected; unfavourable; unforgettable; unkind.

non-: non-effective; non-aggressive; noncomparable; non-

computable; nonconstant; noncontrol lable; nondigital; nondi- mensional; nonprogrammable; nonusable.

ir-: irregular; irrelative; irresponsive; irrational; irreplaceable;

irrecognizable.

7. Derive the nouns from the verbs by means of the given suffixes:

A. -er, -or

To control, to compute, to design, to use, to manufacture, to work, to simulate, to operate, to protect, to process, to deal, to perform, to examine, to program, to execute, to transmit, to convert, to print, to consume, to record.

B. -ion, -sion

To organize, to collect, to combine, to apply (ic), to represent, to add, to corporate, to transact, to compute, to produce, to operate, to execute, to protect, to substitute, to prepare, to invent, to decide, to eliminate, to communicate, to correct, to inform.

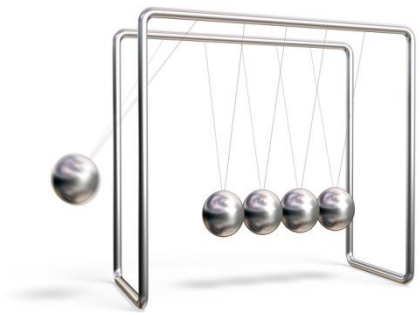
Lesson 3

1. Read the fragment of the article from the INTERNET and translate it with a dictionary. (http://www.livescience.com/47814-classical-mechanics.html).

2. Make the lexical dictionary to the text.

What Is Classical Mechanics?

By Robert Coolman, Live Science Contributor | September 12, 2014



On the photo:
Newton's Cradle demonstrates some simple laws of physics. Credit: Erick N | Shutterstock.com

Using just a few equations, scientists can describe the motion of a ball flying through the air and the pull of a magnet, and forecast eclipses of the moon. The mathematical study of the motion of everyday objects and the forces that affect them is called classical mechanics. Classical mechanics is often called Newtonian mechanics because nearly the entire study builds on the work of Isaac Newton. Some mathematical laws and principles at the core of classical mechanics include the following:

Newton's First Law of Motion: A body at rest will remain at rest, and a body in motion will remain in motion unless it is acted upon by an external force.

Newton's Second Law of Motion: The net force acting on an object is equal to the mass of that object times its acceleration.

Newton's Third Law of Motion: For every action, there is an equal and opposite reaction.

Newton's Law of Universal Gravitation: The pull of gravity between two objects will be proportional to the masses of the objects and inversely proportional to the square of the distance between their centers of mass.

Law of Conservation of Energy: Energy cannot be created nor destroyed, and instead changes from one form to another; for example, mechanical energy turning into heat energy.

Law of Conservation of Momentum: In the absence of external forces such as friction, when objects collide, the total momentum before the collision is the same as the total momentum after the collision.

Bernoulli's Principle: Within a continuous streamline of fluid flow, a fluid's hydrostatic pressure will balance in contrast to its speed and elevation.

Classical mechanics accurately describes the behavior of most "normal" objects. According to "The Dynamic Chemistry E-textbook" from the University of California, Davis Department of Chemistry, to be considered "normal," objects should be "larger than a molecule and smaller than a planet," close to room temperature and going at speeds significantly slower than the speed of light.

3. Write down and learn the definitions of the laws and principles of classical mechanics, which are given in the fragment.

4. Find the full text of the article in the INTERNET. Read and write the annotation to it.

5. Using the link (http://www.livescience.com/33816-quantum-mechanics-explanation.html) find the article "What is Quantum Mechanics?". Find and write down the information about three revolutionary principles of quantum mechanics. Make the lexical dictionary to the fragment.

6. Make a brief review to one of the fragments of this article.

7. Make a brief review to one of the articles from http://www.livescience.com/ section "Technology".

8. Make a presentation. Choose one of the texts "What Is Classical Mechanics? "or "What is Quantum Mechanics?" as a base.

9. Derive the nouns from the verbs by means of the given suffixe. Translate the pairs of words:

-ment

To require, to measure, to equip, to invest, to accomplish, to improve, to develop, to achieve, to displace, to govern, to move.

10. Fill in the blanks with the missing letters:

Parti_le	Fl_id	to interw_ave
Proj_ctile	Rig_d	to d_rive
Sp_cecraft	to r_tain	wave f_nction
Mac_inery	a_titude	sci_ntist
Sol_d	atomic nu_leus	advent_ge

11. Read and correct the mistakes (in spelling and grammar). Write down the correct text:

Ather distinktions betwen the various sub-disciplines of mehanics concern the nature of the bodies being described. Particles is bodies with litle (known) internal structure, treated as mathematical points in classical mechanics. Riged bodis has size and shape, but retain simplicity close to that of the particle, adding just a few so-called degries of friedom, such as orientasion in space.

12. Make an inward using the lexical material of this unit:

P		**i**	**c**										
a	**r**	**t**	**l**	**e**									

Unit 3

1. Перевод конструкций с модальными глаголами.

2. Работа с текстами.

Lesson 1

The Theoretical Part

Перевод конструкций с модальными глаголами

Модальные глаголы в английском языке отличаются от остальных глаголов тем, что они не используются самостоятельно и не обозначают конкретного действия или состояния, они отражают его модальность, то есть отношение к нему говорящего. Вместе модальный глагол и инфинитив значащего глагола образуют составное модальное сказуемое.

Я поеду *в Лондон.*

Я могу поехать *в Лондон.*

Я должен поехать *в Лондон.*

Можно *я* поеду *в Лондон?*

Говорящий может оценивать действие как возможное, необходимое, разрешаемое, просимое, запрещенное, приказываемое, маловероятное, очень вероятное и т. д.

can/may/must/might + Infinitive Passive

переводится словами **«можно, может, нужно, должен» + значение Infinitive Passive**:

Example : *The machine tool can be stopped at any moment. - Станок можно остановить в любой момент.*

must/may/might + Perfect Infinitive

выражает вероятное предположение, значительную убежденность в совершении действия, относящегося к прошлому. Переводятся словами **«должно быть, возможно, не исключено, видимо, следовало бы».** “Might” выражает меньшую степень уверенности совершения действия, чем “may”.

Example: *The condenser may have broken before assembling the unit. - Конденсатор, возможно, сломался еще до полной сборки агрегата.*

Each shift might have followed on where the preceding one stopped. - Каждая смена могла бы продолжать работу там, где остановилась предыдущая.

can/could + Perfect Infinitive

в отрицательной и вопросительной форме выражают сомнение, категорическое отрицание, удивление по поводу того, что действие, выраженное инфинитивом совершилось. Переводятся при помощи слов **«не может быть, разве»**:

Example: *Could he have overlooked such a serious mistake? - Разве он мог пропустить такую серьезную ошибку?*

ought to/should/would + Perfect Infinitive

выражают упрек, порицание по поводу невыполнения действия. Переводятся словами **«следовало бы, должен был бы, надо бы»**. ”Would“ в отрицательных предложениях, относящихся к прошлому выражает упорное нежелание совершить действие.

Example: *This line should have been put into operation long ago. - Эту линию давно следовало бы пустить в эксплуатацию.*

They ought to have paid more attention to the problem of fuel consumption. - Им следовало бы уделить больше внимания проблеме расхода топлива.

The Practical Part

1. Using the link, find information and brush up your knowledges about the modal verbs (http://online-teacher.ru/blog/english-modalnye-glagoly-uprazhnenija). Do the exercises, given at that page.

2. Fill in the table with the missing modal verbs, their equivalents, their meanings and examples.

Verb	Equivalent	Example
Can	to be able to	**I <u>can</u> speak English.** *Я говорю по-английски.* **I <u>am able to</u> speak English.** *Я могу говорить по- английски.*
Could		
Must		
Should		
May		

3. Fill in the blanks by the correct forms of the modal verbs or their equivalents.

1. Our designing bureau… to develop new equipment for our lab.

a) must b) should c) has

2. Solar batteries … to heat and light homes.

a) need b) are able c) must

3. The machines …to be tested under normal conditions.

a) ought b) should c) need

4. You … take all these measurements. We already know the volume of gas in this tube.

a) are not allowed b) can not c) need not

5. As the student was late he… to enter the classroom.

a) may not b) was not able c) was not allowe

4. Translate the sentences into Russian, paying attention to the meaning of modal verbs:

1) He must have the necessary material to accomplish his model in time. 2) The operator thought that the moving parts of the machine must have been lubricated well. 3) Problems that might have taken years to solve are solved now within a few months or even weeks. 4) Nuclear energy may be used to light and heat our homes. 5) A careful examination should be made of generating stations serving individual mines. 6) Some of them might otherwise have never been solved at all. 7) Someday atomic energy might have been used to control the weather of the world. 8) All the preparations must have been completed long ago. 9) The engineer might have overlooked something that may turn out to be important in carrying out this experiment. 10) You may look through the results of his experiment. 11) Such a line cannot have been set up in practice. 12) He cannot have broken the tube while making this experiment. 13) Compressed air or electricity must be employed in both cases. 14) The chief might have obliged him to do this if he wanted.

5. Define the structure of the sentence. Name the parts of speech:

Engineers should use imagination, judgment and reasoning to apply science, technology, mathematics, and practical experience.

Lesson 2

1. Fill in the table, using the dictionary.

2. Find the English equivalents in the text given below.

3. Learn the words.

ENGLISH	RUSSIAN
	решать, находить выход
crucial	
to integrate constraint	
	связь, ограничение
to meet requirements	
	эластичность, упругость, гибкость
	жизнеспособный
	получать, извлекать, выводить
specification	
	соответствующий
To evaluate	
	подходящий
merit	
To eliminate	
core	
	предсказывать, предугадывать
prior	
factor of safety	
	провал, неудача

4. Look through the text “Engineering” and finish the sentences:

1) Engineers should use ... .
2) The unique task of an engineer is ... .
3) Engineers derive specifications ... .
4) Engineers must evaluate the different design choices ... .
5) Testing ensures ... .
6) "Low-level" engineering designs suggest... .
7) Engineers typically include ... .

5. Find and write down the constructions with the modal verbs. Say what meaning do they have.

6. Read and translate the text:

Engineering

Engineering is the application of scientific and technical knowledge to solve human problems. Engineers should use imagination, judgment and reasoning to apply science, technology, mathematics, and practical experience. The result is the design, production, and operation of useful objects or processes.

Methodology

The crucial and unique task of the engineer is to identify, understand, and integrate the constraints on a design in order to produce a successful result. It is usually not enough to build a technically successful product; it must also meet further requirements. Constraints may include available resources, physical or technical limitations, flexibility for future modifications and additions, and other factors, such as requirements for cost, marketability, producibility, and serviceability. By understanding the constraints, engineers derive specifications for the, limits within which a viable object or system may be produced and operated.

Problem solving

Engineers use their knowledge of science, mathematics, and appropriate experience to find suitable solutions to a problem. Creating an appropriate mathematical model of a problem allows them to analyze it (sometimes definitively), and to test potential solutions. Usually multiple reasonable solutions exist, so engineers must evaluate the different design choices on their merits and choose the solution that best meets their requirements. Genrich Altshuller, after gathering statistics on a large number of patents, suggested that compromises are at the heart of "low-level" engineering designs, while at a higher level the best design is one which eliminates the core contradiction causing the problem.

Engineers typically attempt to predict how well their designs will perform to their specifications prior to full-scale production. They use, among other things: prototypes, scale models, simulations, destructive tests, nondestructive tests, and stress tests. Testing ensures that products will perform as expected. Engineers as professionals take seriously their responsibility to produce designs that will perform as expected and will not cause unintended harm to the public at large. Engineers

typically include a factor of safety in their designs to reduce the risk of unexpected failure. However, the greater the safety factor, the less efficient the design may be.

6. Answer the questions:

1) What is engineering?
2) What does the work of an engineer result in?
3) What should an engineer do to result successfully?
4) What may constraints include?
5) What is a mathematical model used for?
6) What did Genrich Altshuller call the best design?
7) What do engineers use to predict the performance of their designs?

7. Try to retell the main information of the text using the answers from the priviest exercise.

8. Translate the sentences into English:

1) Рассуждая и используя воображение, инженер применяет на практике свои научные и технические знания.
2) Не достаточно просто создать какое-либо техническое устройство, важно чтобы оно соответствовало требованиям будущего.
3) Ликвидность, срок службы, продуктивность технической новинки должны быть предсказаны инженером-проектировщиком.
4) Существует множество различных вариантов решений, из которых инженер должен выбрать то, которое соответствует требованиям.
5) Прежде чем модель допускается в массовое производство, она должна пройти испытания.
6) Модель не должна приносить вред использующим ее людям, поэтому в каждую закладывается запас прочности.

Lesson 3

1. Read and say what are the speciality areas of engineering.

The field of engineering is divided into a large number of specialty areas:

Mechanical engineering involves design, manufacturing, inspection and maintenance of machinery, equipment and components as well as control systems and instruments for monitoring their status and performance. This includes vehicles, construction and farm machinery, industrial installations and a wide variety of tools and devices.

Electrical engineering involves design, testing, manufacturing, construction, control, monitoring and inspection of electrical and electronic devices, machinery and systems. These systems vary in scale from microscopic circuits to national power generation and transmission systems.

Civil engineering involves design, construction, maintenance and inspection of large infrastructure projects such as highways, railroads, bridges, tunnels, dams and airports.

Aerospace engineering involves design, manufacturing and testing of aircraft and spacecraft as well as parts and components such as airframes, power plants, control and guidance systems, electrical and electronic systems, and communication and navigation systems.

Nuclear engineering involves design, manufacturing, construction, operation and testing of equipment, systems and processes involving the production, control and detection of nuclear radiation. These systems include particle accelerators and nuclear reactors for electric power plants and ships, radioisotope production and research. Nuclear engineering also includes monitoring and protecting humans from the potentially harmful effects of radiation.

Structural engineering involves design, construction and inspection of load-bearing structures such large commercial buildings, bridges and industrial infrastructure.

Biomedical engineering is the practice of designing systems, equipment and devices for use in the practice of medicine. It also involves working closely with medical practitioners, including doctors, nurses, technicians, therapists and researchers, in order to determine, understand and meet their requirements for systems, equipment and devices.

Chemical engineering is the practice of designing equipment, systems and processes for refining raw materials and for mixing, compounding and processing chemicals to make valuable products.

Computer engineering is the practice of designing computer hardware components, computer systems, networks and computer software.

Industrial engineering is the practice of designing and optimizing facilities, equipment, systems and processes for manufacturing, material processing, and any number of other work environments.

Environmental engineering is the practice of preventing, reducing and eliminating sources of pollution that affect air, water and land. It also involves detecting and measuring pollution levels, determining sources of pollution, cleaning up and rehabilitating polluted sites and ensuring compliance with local, state and federal regulations.

2. Make up 15 questions to the text.

3. Say in English what must a civil, biomedical, computer, industrial engineer do. Use the constructions with the modal verbs.

4. Say in what area of engineering would you prefer to work.

5. Make up a dialog using the information of the text.

Unit 4

1. Упражнения для закрепления, изученного материала.

2. Работа с текстом.

Lesson 1

Practical Part

1. Translate:

radiation protection devices (a glare reflector)
a computer-literate person
a system analyst
personal data base
pica face
cellular phone
raw data
software engineering
climate-controlled office

2. Translate the following words paying attention to the rules of formation of neologisms:

electromatic (electric + automat)
laundromat (laundry + automat)
chemurgy (chemistry + metallurgy)
Sigma (shielded inert gas metal arc welding)
radsta (radio + station)
intercom (intercommunication)

3. Read the exercise. Write down the sentences with the Passive Voice constructions. Define the meanings of passive constructions. Translate the sentences into Russian.

1. The engine is the source of power that makes the wheels go round and the car move. 2. The fuel system is designed to store liquid gasoline and to deliver it to the engine cylinders in the form of vapour mixed with air. 3. A fuel pump which pulls the gasoline through the fuel line is being repaired. 4. Semiconductor theory, junction theory and circuit theory are integrated to explain the behavior of existing devices in circuits. 5. According to W.H.O. (World Health Organization) statistics, heart

diseases were the No.1 Killer. 6. This system is conducive to high volumetric efficiency. 7. This type of mixing is often incidental to other stages of the industrial process, e.g. size reduction. 8. Protective clothing and dry-chemical-type fire extinguisher should be readily available in the area. 9. Not only laboratories, but pilot-type manufacturing plants are included in the center. 10. Mr. Smith used a Global Positioning System (G.P.S.) in his work to install a cellular phone system.

3. Translate the words using these parts of speech. Please pay attention to the conversion:

a) существительные и глаголы model – модель, моделировать

Sunday, measure, value, control, heat, start, stop, store, name, sun, corner, iron, letter, doctor, motor, power, trip, wire, cause, trigger, handle, land, time, echo, chair;

b) прилагательные и глаголы slow – медленный, замедлять

warm, cool, correct, copper, iron, salt, home, lame, last, stable, empty, double, staff, blanch, black, manifest.

4. Read and translate the derivative words. Define the parts of speech:

apply – appliance – applicable
succeed – success – successful
weigh – weight – weightless
operate – operation – operative
mean – meaning – meaningless
invent – inventor – inventive
adjust – adjustment – adjustable
oppose – opposition – opposite
long – length – lengthen
hard – hardness – harden
wide –width –widen

5. Translate the abbreviations consisting of the initial element of the word (read as uncontracted words):

Fig; fig – figure
MAX; max – maximum
Gal; gal – gallon
No – number
amp – ampere
OX; oxy – oxygen
IN; in – inch
sec – section;
LAB; lab – laboratory
cal – calorie
DEP – department
high-tech – high technology

6. Translate abbreviations consisting of consonants (read as uncontracted words):

APRX; aprx – approximately
FT; ft – foot
C. – Centigrade
H; h – hour

KG; kg – kilogram
F. – Fahrenheit
M; m – mark
mm – millimeter
gr. – gramme
YD; yd – yard
s/n – signal to noise
hp – horse power
P. – production
NCR – nuclear
PR – public relations

7. Translate the sentences, paying attention to the passive voice:

1. Fuel is delivered to the injector by a pump which, in its turn, is operated from a shaft.
2. This question was agreed upon after a prolonged discussion.
3. This cycle is continued in each of the cylinders of the engine.
4. The working strokes are so arranged that the crankshaft turns evenly.
5. The composition of steel is affected by various ingredients.
6. The agreement was arrived at yesterday.
7. Next year the new atomic power station will be put into operation.
8. More reliable protection was wanted and special filaments have been used to double the weight per cubic meter.
9. By that time the separate elements of the building had been manufactured at different ferroconcrete factories.

8. Translate into Russian, paying attention to the modal verbs:

1. You may look through the results of his experiment.
2. Such a line cannot have been set up in practice.
3. He must have the necessary material to accomplish his model.
4. This arrangement must be perfectly reliable in operation.
5. He cannot have broken the thermometer while making this experiment.
6. The economy of the design may be readily appreciated from the given figures.
7. Equipment required for transporting frozen foods must be specially designed to withstand operating conditions.
8. Motors and generators brought in must first be given a visual inspection at the receiving sections.
9. Compressed air or electricity must be employed in both cases.
10. Heat must have been removed from the gas to make such a change possible.

9. Divide the given words into three groups - the nouns, the adjectives, the adverbs - paying attention to the suffixes. Translate them.

Organization, functional, available, equipment, processor, completely, architectural, converter, convertible, controller, removable, logical, addition, additional, usually, accomplishment, operator, operation, mainly, communication, insertion, electronic, digital, instruction, generally, arithmetic, daily, development, central, lately, visible, substitution, understandable, application, practical, factor.

10. Look through the text. Find out and mark the passage where these word combinations are used:

1. must go through the graduated licensing process
2. with effective ways to address them
3. the combined efforts of multiple professionals
4. Such credentials go above and beyond the minimum
5. They must often design devices
6. technological applications is necessary
7. them to develop and test reliable machines
8. the physical qualities of materials
9. Many projects require the combined efforts
10. by several organizations
11. as a standout in a particular area
12. within the profession
13. to find the best solution
14. so good communication skills

11. Make a lexical vocabulary of the text.

12. Read the text.

COMPONENTS OF A SUCCESSFUL CAREER AS A MECHANICAL ENGINEER

1_____

Engineering and creative skills dovetail in the work of mechanical engineers. On the one hand, they rely on advanced math—such as trigonometry and calculus—as well as their mechanical acumen to apply engineering concepts to design projects. A solid foundation in research techniques and technological applications is necessary to identify problems and then come up with effective ways to address them. On the other hand, analytical skills are only half the picture: the best mechanical

engineers challenge themselves to look outside the box to find the best solution. Many projects require the combined efforts of multiple professionals, so good communication skills are a must.

2 _____

All mechanical engineers must go through the graduated licensing process in order to work. In addition to the licensing requirements, engineers may obtain voluntary credentials offered by several organizations. Such credentials go above and beyond the minimum, marking the individual as a standout in a particular area. The advanced knowledge and training represented by these credentials increases the chances of finding a job and of advancing within the profession. Some organizations that grant these certifications are:

Association for Facilities Engineering

National Fire Prevention Association

Green Building Certification Institute

Project Management Institute

Engineering Management Certification International

Associated Air Balance Council

3 _____

Some of the most advanced tools and technologies available are those used by mechanical engineers. They must often design devices that stretch physical constraints and perform under strenuous circumstances. Mechanical engineers may use a variety of machines that allow them to develop and test reliable machines and products, including:

Oscilloscopes

Fiber sensors

Accelerometers

Interferometers

Proximity sensors

In addition, mechanical engineers use computer programs such as:

MAYA Nastran

Autodesk AutoCAD

Sigmetrix CETOL 6 Sigma

The MathWorks MATLAB

Ladder Logic

Among other tasks, such programs allow engineers to model scenarios, run simulations, assess the physical qualities of materials and devices, and manage the manufacturing process.

13. Give the title to each part of the text.

14. Translate into Russian one part of the text.

15. Make up 10 questions to the text.

16. Write the annotation to the text (7 – 8 sentences).

17. Using the link find out more information about the career of a mechanical engineer (http://www.learnhowtobecome.org/mechanical-engineer/). **Make a report.**

18. Make a crossword using the lexical material of the previous units.

In addition for reading.

Education.

A Bachelor of Arts (BA) or Bachelor of Science (BS) degree in mechanical engineering is offered at many universities in the United States, and similar programs are offered at universities in most industrialized nations. In the U.S., mechanical engineering programs typically take four to five years and result in a B.S.M.E. /B.A.M.E., or Bachelor of Science! Arts in Mechanical Engineering. Most mechanical engineering programs are accredited nationally by ABET to ensure similar course requirements and standards between universities. The ABET website lists 276 accredited mechanical engineering programs as of June 19, 2006.

Some mechanical engineers go on (o pursue и postgraduate degree such as a Master of Engineering/Master of Science, a Master of Engineering Management, a Doctor of Philosophy in Engineering or an Engineer's degree. The Master and Engineer's degree may consist of either research, coursework or a mixture of the two. The Doctor of Philosophy consists of a significant research component and is often viewed us the entry point to academia.

After being awarded a degree, engineers may seek licensure by a state government. To become a licensed Practicing Engineer, an engineer must

- pass the comprehensive FE (Fundamentals of Engineering) exam,
- work a given number of years as an Engineer in Training (FIT),
- pass the PE (Practicing Engineer) exam.

The purpose of this process is to ensure that engineers possess the necessary technical knowledge and real-world experience to engineer safely. Not every mechanical engineer chooses to become licensed; those that do can be distinguished as Practicing Engineers by the post-nominal title 'PE', as in: Jane Doe, PE. A distinction similar to practicing engineer status is the Chartered Engineer ('CEng') status awarded by some European, Asian and Oceanic engineering organizations. "In most

modern countries, certain engineering tasks, such as the design of bridges, electric power plants, and chemical plants, must be approved by a Professional Engineer or a Chartered Engineer."

Mechanisms and Simple Machines.

Mechanism: the fundamental physical or chemical processes involved in or responsible for an action, reaction or other natural phenomenon.

Machine: an assemblage of parts that transmit forces, motion and energy in a predetermined manner.

Simple Machine: any of various elementary mechanisms having the elements of which all machines are composed. Included in this category are the lever, wheel and axle, pulley, inclined plane, wedge and the screw.

The word mechanism has many meanings. In kinematics, a mechanism is a means of transmitting, controlling, or constraining relative movement (Hunt 78). Movements which are electrically, magnetically, pneumatically operated are excluded from the concept of mechanism. The central theme for mechanisms is rigid bodies connected together by joints.

A machine is a combination of rigid or resistant bodies, formed and connected so that they move with definite relative motions and transmit force from the source of power to the resistance to be overcome. A machine has two functions: transmitting definite relative motion and transmitting force. These functions require strength and rigidity to transmit the forces.

The term mechanism is applied to the combination of geometrical bodies which constitute a machine or part of a machine. A mechanism may therefore be defined as a combination of rigid or resistant bodies, formed and connected so that they move with definite relative motions with respect to one another (Ham et al. 58).

Although a truly rigid body does not exist, many engineering components are rigid because their deformations and distortions are negligible in comparison with their relative movements.

The similarity between machines and mechanisms is that they are both combinations of rigid bodies the relative motion among the rigid bodies are definite. The difference between machine and mechanism is that machines transform energy to do work, while mechanisms so not necessarily perform this function. The term machinery generally means machines and mechanisms.