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# MECHANICAL ENGINEERING

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##### УДК4И (Англ)

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Учебное пособие представляет собой практический курс английского языка для магистров, обучающихся по направлению 15.04.02 «Технологические машины и оборудование». Методическая значимость и новизна пособия заключается в представлении стратегий послевузовского изучения иностранного языка в магистратуре на основе современных стандартов компетентностного подхода в процессе формирования специалистов, на высоком уровне владеющих иностранным языком.

В пособии представлено большое количество текстов и упражнений, содержащих стратегии обучения иностранному языку, позволяющих магистрам овладеть методикой самостоятельной работы послевузовского изучения иностранного языка. Справочные материалы обеспечены глоссарием, содержащим методические и общие термины.

Пособие включает в себя основные тематические разделы, необходимые для подготовки к сдаче кандидатского экзамена по английскому языку. Оно составлено в соответствии с программными требованиями и с учетом кросс-культурных особенностей научной деятельности в вузах нашей страны и за рубежом.

Подготовлено на кафедре иностранных языков НХТИ ФГБОУ ВО «КНИТУ».

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**SECTION 1**

**UNIVERSITIES AND FURTHER EDUCATION**

*FOCUS VOCABULARY*

1. graduate (from) – закончить высшее учебное заведение;
2. graduation paper – дипломная работа;
3. post-graduate (student) – аспирант; ~studies – учеба в аспирантуре;
4. campus – университетский комплекс;
5. certificate – удостоверение, сертификат;
6. council – совет; academic ~ – ученый совет;
7. course – курс (теоретический); compulsory ~ – обязательный курс; optional ~ – необязательный / факультативный курс;
8. to take a post-graduate ~ in – поступить/учиться в аспирантуре;
9. to design / to tailor ~ – разработать курс;
10. in-service training ~ – курс повышения квалификации;
11. curriculum – программа, учебный план;
12. syllabus – программа (обучения);
13. department – кафедра, отделение; head of (the) ~ – заведующий кафедрой, руководитель отделения; the ~ of English/the English ~ – кафедра английского языка; correspondence ~ – заочное отделение; full time ~ – дневное отделение; part time ~ – вечернее отделение;
14. diploma – диплом; the ~ in higher education – диплом о высшем образовании;
15. education – образование; higher ~ – высшее образование, высшая школа; further (post-diploma) ~ – последипломное образование;
16. college – колледж; ~ of higher education – колледж; ~ of further education/further education college – ~ of technology/commerce/art – технологический, коммерческий, художественный колледж; technical ~ – техникум;
17. school – школа, училище; ballet ~ – хореографическое училище; art ~ – художественное училище; vocational ~ – профессиональное техническое училище; medical ~ – медучилище;
18. university – университет; pedagogical (teacher-training)~ – педагогический университет; polytechnical ~ – политехнический университет technological ~ – технологический университет; medical ~ – медицинский университет agricultural ~ – агротехнический университет; Oxford/Cambridge university, London university, but the University of London;
19. faculty – факультет; ~ of arts (arts faculty) – факультет гуманитарных наук (языки, история, философия и др.); ~ of social sciences – факультет общественных наук; ~ of education – педагогический факультет; ~ of science – факультет естественных наук (биология, химия, физика и др.); ~ of engineering – факультет технических (прикладных) наук; ~ of medicine/law – факультет медицины/права; ~ of economics/history – экономический, исторический факультет; philological faculty or faculty of arts / arts faculty – филологический факультет;
20. field of study – область изучения;
21. grant – стипендия, материальная поддержка;
22. to train – обучать; ~ smb. for a job/profession – готовить кого-либо к профессии;
23. laboratory – лаборатория, кабинет, biology/chemistry ~ – кабинет биологии/химии;
24. staff – штат; teaching/academic ~– профессорско-преподавательский состав; ~ meeting – заседание кафедры; ~ room – преподавательская;
25. lecturer – преподаватель; university teacher/~ – преподаватель университета; senior ~ – старший преподаватель; principal ~ or reader – доцент; junior or assistant ~ – ассистент;
26. tutor – куратор;
27. in-service training of teachers – повышение квалификации преподавателейю

***Note****. The term “further education” is associated in many countries abroad with after-school education that is with college and university education. People who undertake “further education” beyond the age of 18 pay fees for their tuition as well as their living costs. In our country “further education” is associated with postgraduate studies, the level which assumes to a larger extent a lot of research work, acquiring knowledge of new methodologies and new trends. Thus in Section I we’ll start discussing the university education in our country and abroad and in Section II proceed to academic degrees and postgraduate studies.*

**TEXT 1. EDUCATION IN THE 21ST CENTURY**

Many countries consider education a major vehicle of social advancement. Training of highly qualified specialists, capable of solving the most complex problems of modern society is the main priority of higher education. The efforts of our scientists have always been focused on the fundamental problems of humanities, natural and social sciences. Knowledge, science and culture open the prospects into the future for every person. At the end of the century the system of higher and further education in Russia underwent a process of great reforms. They were initiated to provide closer links between education and technological needs of industry. New goals were set to link higher education more directly to the economy, improve the quality of scientific research, provide educational and research institutions with more modern technology and new laboratory facilities. The major significance of the reforms was to move toward the democratization of university administration and the “humanitarization” of the educational process in terms of students’ individual aptitudes and needs. A distinguishing feature of our universities is that they are becoming internationally oriented. We have joined the European Cultural Convention, which enables us to participate in all projects concerning higher and further education, academic mobility and recognition of qualification. The universities also expand their cooperation with such authoritative international organizations as UNESCO and the Council of Europe. The need to make education more democratic and universal arises from the fact that our country is integrating with the European community. In this respect, educators have to think of how our universities should educate their students about the rest of the world. The world in which most adult Russians grew to maturity no longer exists. The cold war is over. Issues such as environment, exchanges rate, and economic competition, public health, national security, poverty, population control, and human rights affect every country domestically as well as internationally. Under these circumstances attending to domestic needs requires understanding of national, cultural, and socio-economic boundaries. The characteristic feature and the main trend in modern higher and further education is not only to check students’ knowledge but develop their abilities and creative thinking. Today’s scientific and technological progress demands of the university graduates to be prepared to deepen their knowledge individually and adapt themselves quickly to the changes in the branches or science or industry they have chosen as their speciality or research. In addition to offering programs based on traditional academic disciplines, higher education must develop problem-focused programs of study that are more practical than theoretical and are oriented around problems of the real world. Much has already been done and is being done to transform the national system of education. A wide range of non-state schools, colleges and institutes have been introduced. There have been certain curriculum changes starting from 1992. Some higher educational establishments began changing tuition in the above-mentioned direction. Of course, university education in Russia still faces a great variety of problems, connected with implementation of new disciplines, retraining of the faculty, reorienting university policies and programs towards new goals. But if we want to prosper in the new environment of the 21st century, our universities must truly orient themselves around new goals. None of these goals will be achieved quickly and easily but the benefits of putting them in place will far exceed the efforts required.

**1. Answer the questions.**

1. What is the role of education in modern society? Has it changed a lot with a course of time? 2. At the turn of the century higher and further education underwent great reforms. What are these reforms aimed at? 3. What are the distinguishing features and the main trends in higher and further education? 4. What does the need to make universities more democratic and internationally oriented arise from? 5. Why is it necessary to develop creative thinking? What are the ways of achieving this goal? 6. What difficulties do we face on the way of reforming the system of education? 7. Do you agree that reforming the system of education we shouldn’t forget our national interests and values in education? We must preserve all the achievements of the previous school not to destroy the whole system.

**TEXT 2. MODERN UNIVERSITY SYSTEM**

**IN GREAT BRITAIN**

 There are 90 universities in Great Britain today, compared with 47 in 1990, and only 17 in 1945. They fall into five broad categories: the medieval English universities, the medieval Scottish ones, the nineteenth century “redbrick” ones, the previous polytechnics, and finally the twentieth-century “plate-glass” universities. They are all private institutions, receiving direct grants from central government There are not very important legal distinctions between the various types of universities in the country. But it is possible to discern a few broad categories.

 ***Oxbridge***

This name denotes the universities of Oxford and Cambridge, both founded in the medieval period. They are federations of semi-independent colleges, each college having its own staff, known as “Fellows”. Most colleges have their own dining hall, library and chapel and contain enough accommodation for at least half of their students. The fellows teach the college students, either one-to-one or in very small groups (known as “tutorials” in Oxford and “supervisions” in Cambridge). Oxbridge has the lowest student/staff ratio in Britain. Lectures and laboratory work are organized at university level. As well as the college libraries, there are the two university libraries, both of which are legally entitled to a free copy of every book published in Britain. Before 1970 all Oxbridge colleges were single-sex (mostly for men). Now, the majority admit both sexes. 10 The students of these universities make up one of the most elite elites in the world. Many great men such as Bacon, Milton, Cromwell, Newton, Byron, Darwin, Rutherford and many other scientists and writers were educated there as well as members of the Royal family. Nowadays their pre-eminence is diminishing, but not extinct. These two ancient universities have, through the centuries, had a major role in English politics– Oxford more than Cambridge. Of the nine prime ministers since 1955 Mrs Thatcher was the seventh to have been to Oxford University. In 1988 her cabinet of twenty-one included seven who had been to Oxford, seven to Cambridge; two had been to old Scottish universities, one to London, none to any other university in England. The top civil servants have a similar background. This preponderance of Oxford and Cambridge graduates among the political elite (and among MPs in general) has declined, but it is still significant.

 ***The Old Scottish University***

Scotland is proud of its four ancient universities: Glasgow, Edinburgh, Aberdeen and St Andrews, all founded in the fifteenth and sixteenth centuries. The last of these resembles Oxbridge in many ways, while the other three are more like civic universities (see below) where most of the students live at home or find their own rooms in town. At all of them the pattern of study is closer to the continual tradition than to the English one – there is less specialization than at Oxbridge. Created with strong links with the ancient universities of continental Europe they followed their longer and broader course of studies. Even today Scottish universities provide four-year undergraduate courses, compared with usual three-year courses in England and Wales.

 ***The Early Nineteenth-Century English Universities***

Durham University was founded in 1832. Its collegiate living arrangements are similar to Oxbridge, but academic matters are organized at university level. The University of London started in 1836 with just two colleges. Many more have joined since, scattered widely around the city, so that each college (most are nonresidential) is almost a separate university. The central organization is responsible for little more than exams and the awarding of degrees.

***The Older Civic ('Redbrick') Universities***

 During the nineteenth century various institutes of higher education, usually with a technical bias, sprang up in the new industrial towns and cities such as Birmingham, Manchester and Leeds. Their buildings were of local material, often brick, in contrast to the stone of older universities (hence the name 'red- 11 brick'). They catered only for local people. At first, they prepared students for London University degrees, but later they were given the right to award their own degrees, and so became universities themselves. In the mid twentieth century they started to accept students from all over the country.

 ***The Campus Universities***

 These are purpose-built institutions located in the countryside but close to towns. Examples are East Anglia, Lancaster, Sussex and Warwick. They have accommodation for most of their students on site and from their beginning, mostly in the early 1960s, attracted students from all over the country. (Many were known as centres of students protest in the late 1960 and early 1970s.) They tend to emphasise relatively 'new' academic disciplines such as social sciences and to make greater use than other universities of teaching in small groups, often known as 'seminars'.

***The Newer Civic Universities***

 These were originally technical colleges set up by local authorities in the first sixty years of this century. Their upgrading to university status took place in two waves. The first wave occurred in the mid 1960s, when ten of them (e.g. Aston in Birmingham, Salford near Manchester and Strachclyde in Glasgow ) were promoted in this way. Then, in the early 1970s, another thirty became 'polytechnics', which meant that as well as continuing with their formers courses, they were allowed to teach degree courses (the degrees being awarded by a national body). In the early 1990s most of these (and also some other colleges) became universities. Their most notable feature is flexibility with regard to studying arrangements, including 'sandwich' courses (i.e. studies interrupted by periods of time outside education). They are now all financed by central government.

***The Open University***

 This is one development in education in which Britain can claim to have\ led the world. It was started in 1969. It allows people who do not have the opportunity to be ordinary 'students' to study for a degree. Its courses are taught through television, radio and specially written course-books. Its students work with tutors, to whom they send their written work and with whom they then discuss it, either at meetings or through correspondence. In the summer, they have to attend short residential courses of about a week.

 ***Note:*** *In the text below an international student shares his experience of studying in Britain. He finds the students’ life at the University quite relaxing and enjoyable but the requirements seem to be rather demanding. What’s your idea of studying at the university abroad?*

 ***Studying at the University***

 Students from others countries that I met at university often took a long time to get used to the system. The university terms lasted only six months' and you were free to do what you liked in the vacations. Attendance of lectures was optional, and the only compulsory assignment was to write an essay once a week and present it to your tutor. The idea was that you were not supposed to be there to obtain an academic qualification, but to extend your knowledge of the subject in your own way. It was all there in the libraries and laboratories and lecture halls if you looked for it. A poor American student who had attended all the tutor's lectures once reproduced them almost word for word in his essay, and the tutor said: “I know what I think. What do you think? The life of an undergraduate was relaxing and enjoyable, but you had to work things out for yourself.”

 ***Noteю*** *In British universities, there is normally only one Professor for a given subject; other university teachers are called lecturers. They are also tutors when they give individual students classes in small numbers.*

**1. Answer the questions.**

1. Is this system similar to that of your country? If not what is the difference? 2. Why do you think people go to university? Do you think they go for the right reasons? 3. What did an American tutor expect his students to do? What similarities and differences have you noticed compared with out system of education?

 ***Note.*** *Maria Brown tells us about her educational background. Complete each sentence with one of the words or phrases from the box below. Then speak on your own educational background. You may use Maria’s as a model.*

1. I started at … in London when I was 5.

2. At the age of 11, I went on to …, also in London.

3. At 17, I … to university.

4. I got a … at Manchester to … Engineering.

5. In fact I was awarded a … .

6. But at the end of the first year I changed to another …

7. I … from University in 2003.

8. I have a first class … in Economics.

9. I decided to … at university.

10. So I did a … in business administration at the University of California.

11. During the course, I did an … on small business development.

12. I found the topic so interesting that I applied for a … to do a doctorate on the same subject.

13. Once I had got the money, I had to write a 50,000 word …

14. So now I have a BA, an MBA and a …

15. All I need now is a …

**SECTION 2**

**ACADEMIC DEGREES**

**AND POSTGRADUATE STUDIES**

*FOCUS VOCABULARY*

1. science – наука;
2. natural ~ (or the natural sciences) – естественные науки; the exact ~es – точные науки; the mathematical ~ (or the mathematical sciences) – математические науки; social ~ (or the social sciences) – общественные науки; ~ and technology – наука и техника;
3. scientific – научный; ~ method/approach/principle – научный метод/подход/принцип; ~ work/research – научная работа/исследование;
4. scientist – ученый (естественные науки);
5. scholar – ученый (гуманитарные науки);
6. learned – научный; ~ society – научное общество; ~ work/ article/language – научный труд/журнал/статья; ~ paper – научный доклад; ~ journal – научный журнал;
7. arts – гуманитарные науки (humanities); faculty of ~ – факультет гуманитарных наук; liberal ~ – гуманитарные науки (язык, философия, история и т.д.);
8. Candidate/Doctor of Philology – кандидат/доктор филологических наук; ~ of psychology – кандидат/доктор психологических наук; ~ of education – кандидат/доктор педагогических наук; ~ of economics – кандидат/доктор экономических наук; ~ of laws – кандидат/доктор юридических наук;
9. research– исследование, научно-исследовательская работа; to do/carry out /conduct ~ (on/in/into) – проводить исследования (по); to be engaged (in) ~ – проводить исследования; ~ degree – ученая степень; ~ institute – научно-исследовательский институт; ~ center – исследовательский центр; ~ student – аспирант (postgraduate student); ~ subject / topic – тема исследования; ~ worker/researcher – научный работник;
10. degree – степень (ученая); to award/confer a ~ – присвоить степень; to get/take/receive a ~ – получить степень; to hold/have a ~ – иметь степень; first ~ – диплом бакалавра наук; Bachelor’s ~ – степень бакалавра; higher ~ – ученая степень; Master’s ~ – степень магистра; Doctorate ~ (PhD) – степень кандидата наук; ~ of Candidate of sciences (Candidate’s degree) – степень кандидата наук; ~ of Doctor (Doctor of sciences) – степень доктора наук;
11. dissertation/ thesis – научная работа, диссертация; to defend one’s ~ – защитить диссертацию; to submit a ~ for hearing at the session of the Academic Council – предста- вить диссертацию для обсуждения на заседании Ученого совета;
12. field of study – область исследований.

***Note.*** *Modern academic education in our country comprises four stages: Bachelor’s degree, Specialist’s degree, Master’s degree, Postgraduate degree. Academic degrees abroad differ in many ways which is the point of our further discussion.*

**TEXT 1. ACADEMIC DEGREES ABROAD**

 A degree is an academic qualification awarded on completion of a higher education course (a first degree, usually known as Bachelor’s degree) or a piece of research (a higher/further degree, doctorate and so on). There exists considerable diversity of degrees in various countries. But in spite of the lack of equivalence of degrees some similarities can be found among certain groups of countries, particularly those of the British Commonwealth, continental Europe, America and the Far East.

 One can distinguish the principal types of academic degrees – bachelor, master, and doctor which represent different levels of academic achievements. The naming of degrees eventually became linked with the subject studied, arts is used for the humanities, science – for natural and exact sciences.

 **The Bachelor’s Degree** is the oldest and best known academic degree. Some varieties of bachelor’s, or baccalaureate, degrees are Bachelor of Arts (BA) degree and Bachelor of Science (BSc). Abbreviations vary between institutions. Other baccalaureate degrees offered by most universities are Bachelor of Education, Bachelor of Music, Bachelor of Business Administration, Bachelor of Home Economics.

The Bachelor’s degree can be attained by students who pass their university examinations, or in some cases other examinations of equivalent level. This normally involves at least three years of full-time study after passing the advanced level certificate of education at the age of about eighteen, so most people who become BA, BSc, etc. do so at the age of at least twenty-one. First degrees in medicine require six years of study, some others four.

 It is now quite usual for students in subject such as engineering to spend periods during their degree courses away from their academic studies, in industrial location so that they may get practical experience. A student of a foreign language normally spends a year in a country where that language is spoken. Bachelors' degrees are usually awarded on the basis of answers to several three-hour examinations together with practical work or long essays or dissertations written in conjunction with class work. Degrees are classified. About a tenth (or less) of candidates win first-class, honours degrees, three quarters - second-class, and the rest - third class, or pass without fail. A person studying for a degree at a British university is called **an undergraduate.**

 About 33 per cent of students continue to study for **degrees of Master** (of Arts, Science, Education, Business Administration, Music, Fine Arts, Philosophy, etc.). About 45 varieties of Master of Arts and 40 varieties of Master of Science degrees are reported. The degree of Master in general requires one or two further years of study, with examination papers and substantial dissertation. Bachelors’ and Masters’ degree can be conferred “with honours” in various classes and divisions, or “with distinction”. This is indicated by the abbreviation “(Hons”) and is often a prerequisite for progression to a higher level of study.

A minority (about 15 per cent) goes on further, preparing theses which must make original contributions to knowledge, for the most advanced degree of **Doctor of Philosophy (Phd) or Doctor of Science (DSc).** Abbreviations for degrees can place the level either before or after the faculty or discipline depending on the institution. For example, DSc and ScD both stand for the doctorate of science.

Doctor’s degrees in many foreign countries are of two distinct types: **professional or practitioner’s degrees, and research degrees.**

The former represent advanced training for the practice of various professions, chiefly in medicine and law. The principal ones are Doctor of Sc. Medicine, Doctor of Dental Science of Dental Surgery, Doctor of Veterinary Medicine, Doctor of Pharmacy, and Doctor of Jurisprudence. These degrees carry on implication of advanced research. Quite different in character are the research doctorates which represent prolonged periods of advanced study, usually at least three years beyond the baccalaureate, accompanied by a dissertation designed to be a substantial contribution to the advancement of knowledge. The most important of these is the Doctor of Philosophy, which represents advanced research in any major field of knowledge.

Second in importance and much more recent as a research degree is the Doctor of Sc. Education (Ed.D.) It was first awarded by Harvard in 1920, but was preceded by the equivalent Doctor of Pedagogy first conferred by New York University in 1891. The only other earned doctorates of the research type currently conferred by 10 or more institutions are the Doctor of the Science of Law and the Doctor of Business Administration.

 Since there is no full equivalence in foreign and native academic degrees system, draw an approximate parallels and compare them.

***Note.*** *It may be of some interest for you to acquaint yourself with the curriculum and post-graduate training programs in other countries. Read the text carefully and find some differences and similarities in the postgraduate course in the United Kingdom and that of our country.*

**TEXT 2. POSTGRADUATE TRAINING PROGRAMS**

All further education which comes after baccalaureate can be regarded as postgraduate education. It presupposes carrying a lot of research work, acquiring knowledge of new methodologies and new trends. It may lead to either a Master’s degree (a three-year program of study) or PhD (usually a two-year course of study).

 *Postgraduate programmes are either research degrees or taught courses.*

***Taught courses*** last one or more years and are either designed so that you deepen your knowledge gained from your first degree or for you to convert you expertise to another field of study. Examples of these include changing to law to become a solicitor and training to become a teacher.

Degrees by instruction are very similar to undergraduate courses in that most of the time is devoted to attending lectures. This may take up the first eight or nine months of the course and is followed by written examinations. A period of research lasting from two or three months usually follows and the results of it are presented in the form of a thesis. Finally, an oral examination is held, lasting perhaps an hour or two, to test the knowledge accumulated throughout the year. Most programmes, which involve classes and seminars lead up to a dissertation.

 ***Research course*** is quite a different type of study from a taught course. First of all it lasts longer, for about three years providing Master’s or doctorate qualifications. They allow you to conduct investigations into your own topic of choice and are of use in jobs where there are high levels of research and development.

The most well-known research qualification is the Doctor of Philosophy (PhD, a three-year study programme). There is a shorter version called a Master of Philosophy (MPh) which takes the minimum amount of time of two years. Both of these qualifications require the students to carry out a piece of innovative research in a particular area of study. Also possible is the research based on Master of Science (MSc.) and Master of Arts (MA) degrees. A recent development is the Master of Research (MRes), which provides a blend of research and taught courses in research methods and may be a taken as a precursor to a PhD.

 It is a common practice for students to be registered initially for the MPhil and to be considered for transfer to the PhD after the first year of study, subject to satisfactory progress and to a review of the proposed research. All research degree programmes involve an element of research training designed to ensure that students are equipped with the necessary skills and methodological knowledge to undertake original research in their chosen field of study. The training programme includes the development of generic skills relevant to the degree programme and a future career. Although the training element is not a formal part of the assessment for the degree, it constitutes an important basis for research and may take up a significant part of the first year.

 The start of a research degree involves a very extensive survey of all previous works undertaken in that area. At the same time, if a student is planning to carry out any practical experimentations, the necessary equipment must be obtained. This preliminary part of the study can take up to six months, but it is important to note that the process of keeping up to date with other work going on in the subject must continue throughout the entire period of the research.

The next stage of a research course usually involves collecting information in some way. This might be through experimentation, in the case of arts, social sciences or humanities degree. The important thing is that something new must be found.

 This second part of the procedure takes about two years in the case of a PhD. The research is written up in the form of a thesis during the final six months of the three-year period. Typically, this will contain an introduction, methodology, results and discussion. As in the case with taught degrees, the research must then be examined orally. Occasionally, if the examiners are not completely happy with the work they may ask the candidate to rewrite parts of the thesis. Hopefully, a good supervisor will make sure this does not happen!

 ***Note:*** *What qualities does research demand from postgraduate students, those young people who make up their minds to devote themselves to scientific research? Some of these qualities are mentioned in the text below. Think of the other ones, for example, you may enjoy solving problems, you may have creative abilities or things like that. Are you patient enough, industrious and hard-working for this kind of activity?*

Different types of study require similar qualities from the people who undertake them. Both demand an inquisitive mind that will maintain the motivation to learn and discover new information. They also both demand a high level of intellectual ability in order to cope with the pressures of understanding the possible complex arguments, facts or theories. Both require a high degree of organizational ability and time management, as so many different things need to be attended to.

***Note:*** *Why undertake postgraduate study? There are various reasons for choosing postgraduate study but some reasons are more positive than others. Look through the texts below and get ready to discuss different motivating reasons to do a higher degree.*

**Tom Brown: “I Really Enjoy My Subject”**

This is a highly motivating reason to do a higher degree. It’s worth considering the long-term implications of your choice. Does your choice of course fit in with your long-term career plans? That does not mean that you should only consider postgraduate programmes related to your area of work interest. All further study programmes will enable you to develop skills that you could market to an employer.

**Emily Wright: “I Need It to Pursue My Chosen Career”**

This is an obvious positive reason for undertaking further study. Some career areas do require a professional qualification, for example law, teaching, social work, librarian ship or clinical psychology. For other employment areas a postgraduate qualification, although not essential, will provide a distinct advantage to applicants, particularly when competition for places is fierce. In any case it will make you stand out from the crowd and get you a better job. Research the area of work that interests you to identify whether a postgraduate course would be necessary or advantageous to you.

 **Martin Scott: “I Don’t Know What to Do – This Will Give Me More Time to Decide”**

Past experience suggests undertaking a further year or more of study is unlikely to lead to careers inspiration! If you choose a course for this reason, it is important to use the duration of the course to decide what options are open to you, what skills you have to offer, what you want out of a job or may be jobs, what jobs would suit you in general.

***Note:*** *Apart from the above reasons you may have some others worth mentioning. Put them down in the order of preference in writing.*

*There can be less optimistic opinions about taking postgraduate or doctorate courses. Some people consider post-graduate study and doctorate a mere waste of time and effort. Express your opinion on the problem. If you disagree with something, debate and give your arguments.*

**Pamela Bain**

The idea of original research can conjure up thoughts of constant intellectual excitement and cries of ‘eureka!’ The reality may be rather different. Studying for a research degree is very different to studying for an undergraduate degree. Consider carefully whether or not you would enjoy the basic research techniques you are going to use. Can you imagine counting black dots down a microscope for weeks on end? OK spending a year, or two, building equipment before generating a single result? Will you be happy working alone in a library for days on end? The breakthrough, when it happens, can be euphoric, but when results refuse to come it can bу deeply disappointing. Tom Sight Doctorates don’t count for much outside academia – and in fact they may count against you. If you can’t find a directly relevant area for subsequent professional work, then many employers are likely to look at you, a 25-30 year old person with three-six years of post-graduate work as being a strange and slightly worrying employment prospect – they’re going to be too smart for their own good. Another thing you won’t be told is how many people don’t complete their doctorates. I’ve heard various figures mentioned, but I believe that around 50% of people who start doctorates don’t get a PhD out of it. An enormous proportion of people simply never finish the things because it’s not quite what they were expecting when they started.

***Note:*** *Research the area of work you wish to enter to identify how potential employers would view applicants with postgraduate qualifications. What new experience and knowledge would you gain from the post-graduate course of study?*

*What is your motivation for taking a post-graduate course? Is it only because of helps for future career making? Sum up all pros and cons and make a presentation in class. The text below provides you with extensive information to think about and to help you find the right answer.*

**TEXT 3. CAREER PROSPECTS**

**FOR POST-GRADUATES**

Just getting a university degree isn’t enough nowadays. Employers are increasingly looking for graduates who can hit the ground running. Postgraduate courses are monitored to match the needs of employers and make you “work ready”. Each degree has been developed in response to current market demands for specific skills. Employers look for graduates who can demonstrate both breadth and depth of subject knowledge. Combining subjects in a degree programme is a popular way of tailoring a course to reflect your career aspirations. Work experience plays a key role in making yourself employable. Some of the benefits are: the chance to put theory into practice; development of key skills; greater understanding of career choices; valuable career contacts for the future. Business is increasingly dependent on international trade, and employment opportunities demand well developed language skills. The course of foreign language will provide a broad range of language training opportunities for all students whatever course they are taking. To find the right career for you, you need to think about the occupations and jobs available – the skills, qualifications, experience and aptitudes you need and whether they are right for you. A postgraduate qualification from the BSU will be one that is recognized globally and will provide an excellent route to better career prospects. Major companies say they would rather employ students from the BSU. The University’s graduates benefit from our tradition of strong ties with business and industry.

We can say that our courses were more vocational, with students developing better jurisprudence, teamwork and communication skills.

The BSU’s high quality facilities and teaching and its interdisciplinary approach to research will enable you to make the most of research and learning opportunities available whilst studying for your scientific degree. It provides exceptional opportunities for research with commercial applications, drawing upon decades of working relationships with business and industry. All stu- 24 dents here receive “appropriate and relevant preparation, training and support for their development, helping them both to complete a high-quality doctoral thesis and to develop a range of knowledge, understanding and skills necessary for their future employment”.

 There are undoubtedly scenarios in which a generic or interdisciplinary approach would yield interesting results: for example, one could imagine how networking, team working, and some communication skills could be enhanced through contact with others outside one’s subject area. Such elements of training must, however, be carefully handled, because the current crop of PhD students are surely busier than their predecessors, and are being required to professionalize earlier. Not only are they working to finish their dissertations within the three-year period of their awards; but also often teaching, attending conferences, making research trips, attending meetings, and engaging in other activities entirely appropriate to their stage of career.

 It is clear that development of communication skills and participation in a research seminar are linked to an important professional activity: going to a conference and speaking about one’s work. Students are explicitly prepared for this experience in a special session on ‘conference culture’, in which they are given pointers about how to propose and present a paper, and are taught the conventions of an oral text. They are encouraged to use the conference as a way of raising their individual profiles, and as a springboard for future publications. The delicate issue of networking is also addressed. The session is also an appropriate opportunity to plant in their minds the idea of running a conference themselves, thus further enhancing their organizational skills. Conference activity forms an important part of the career of any academic; for postgraduates it is an important way of participating in academic debate, and ‘showcasing’ their own work.

 By the end of the second year of the program it can be seen together: the postgraduates are taught to make practical progress in the number of key areas of academic endeavor, with a view to having a significant body of experience by the time they complete their degrees. Introducing this information in the second year also helps to focus students’ minds on the key question of whether or not these postgraduates pursue academic careers, they will almost certainly be required to undergo an interview in order to obtain gainful employment.

 It is therefore crucial to present them with opportunities to hone their skills in this area. By this stage of the programme they will have had experience of delivering their material in a public forum, and will have made an attempt to develop their presentation skills; they should also have had other opportunities to defend their ideas, making a substantial, original contribution to knowledge in a specific area.

**SECTION 3**

**MECHANICAL ENGINEERING**

*FOCUS VOCABULARY*

1. engineering - инженерное дело, конструирование, машиностроение;
2. mechanical - engineer инженер-механик, машиностроитель, инженер по механическому оборудованию;
3. automotive - engineering автостроение, автомобильная техника;
4. engineering - solutions техническое, инженерное решение;
5. an automobile - легковой автомобиль, машина;
6. a vehicle - автотранспортное средство, любое средство передвижения;
7. machinery - механическое, машинное оборудование;
8. dynamics - динамика, динамические характеристики;
9. statics - статика, электростатические явления;
10. hydraulics - гидравлика, гидравлическая система;
11. strength of materials - сопротивление материалов;
12. kinematics - кинематика, кинематическая схема;
13. applied thermodynamics - прикладная термодинамика;
14. mechanism -механизм, механическое воздействие;
15. efficiency - эффективность, уровень качества.

**TEXT 1. MECHANICAL ENGINEERING**

**AS A FUTURE PROFESSION**

*Engineering as said in the English-English dictionary is:*

1. The practical application of scientific knowledge in the design, building and control of machines, roads, bridges, electrical apparatus, chemicals;

2. The work, science or profession of an engineer.

The primary types of engineering are chemical, civil, electrical, industrial, and mechanical.

We will study thoroughly mechanical engineering. Mechanical engineering is the application of physical principles to the creation of useful devices, objects and machines. Mechanical engineers use principles such as heat, force, and the conservation of mass and energy to analyze static and dynamic physical systems, in contributing to the design of things such as automobiles, aircraft, and other vehicles, heating and cooling systems, household appliances, industrial equipment and machinery, weapons systems, etc. Fundamental subjects of mechanical engineering include: dynamics, statics, strength of materials, hydraulics, kinematics, and applied thermodynamics. Mechanical engineers should understand and be able to apply concepts from the chemistry and electrical engineering fields.

Engineers in this field design, test, build, and operate machinery of all types; they also work on a variety of manufactured goods and certain kinds of structures. The field is divided into machinery, mechanisms, materials, hydraulics, and pneumatics; and heat as applied to engines, work and energy, heating, ventilating, and air conditioning. The mechanical engineer, therefore, must be trained in mechanics, hydraulics, and thermodynamics and must know such subjects as metallurgy and machine design. 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.

The automobile was invented in the late 1800's and did not come prominence until the early 20t h century. Its basic configuration was determined and mass-production methods were established.

It becomes available to a society. The automobile vastly expanded most people's mobility horizons. It enabled profound changes in most aspects of modern life. New roads were built to support the automobile. But as there are many advantages so disadvantages of the car invention also exist. It includes air pollution and car accidents. But all this fostered new engineering solutions to improve the quality of the human condition.

**1. Choose from the text and put down the English equivalents to the Russian word combinations given below:**

* сельскохозяйственная машина
* применение научных знаний
* создание полезных приборов
* основные дисциплины
* промышленные изделия
* паровые турбины
* загрязнение воздуха
* электрические приборы
* система подогрева и охлаждения
* промышленное оборудование
* серийное производство
* дорожно-транспортное происшествие

**2. Complete the sentences with given verbs.**

*Operate\ use\ specialize\ design\ divided\ work\ study*

1. We will.. .thoroughly mechanical engineering.

2. Mechanical engineers.. .principles such as heat, force.

3. Engineers in this field..., and... machinery of all types.

4. They also.. .on a variety of manufactured goods.

5. The field is...into machinery, mechanisms, materials, hydraulics.

6. Some of them.. .in particular types of machines.

**3. Answer the following questions.**

1. What is engineering?

2. What types of engineering do you know?

3. Why do mechanical engineers use such principles as heat, force, and the conservation of mass and energy?

4. What subjects must the mechanical engineer be trained in?

5. Are there any disadvantages of the car invention?

5. Cover the text. In pairs, try to remember five things about mechanical engineering.

6. Speak about mechanical engineering as a future profession.

**TEXT 2. AUTOMOTIVE ENGINEERING**

*FOCUS VOCABULARY*

1. incorporate – включать;
2. software - программное обеспечение;
3. safety engineering - техника безопасности;
4. involve – вовлекать;
5. separate – разделять;
6. stream – направление;
7. determine – определять;
8. delivery – поставка;
9. responsible – ответственный;
10. evaluation – оценка;
11. conduct – проводить;
12. level – уровень;
13. interaction – взаимодействие;
14. interference – помеха;
15. handle – решать;
16. team – команда;
17. powertrain – трансмиссия;
18. exterior – внешний;
19. interior – внутренний;
20. **Read the text.**

Automotive engineering is a branch of Vehicle engineering. It incorporates elements of mechanical, electrical, electronic, software and safety engineering as applied to the design, manufacture and operation of automobiles, buses and trucks and engineering subsystems.

Automotive engineers are involved in almost every aspect of designing cars and trucks. Broadly speaking automotive engineers are separated into three main streams: product engineering, development engineering and manufacturing engineering.

- Product engineer (also called design engineer), that would design components/systems (i.e brake engineer and battery engineer).

- Development engineer, that engineers the attributes of the automobile.

- Manufacturing engineer determines how to make it.

A Development Engineer is a job function within Automotive Engineering, in which the development engineer has the responsibility for coordinating delivery of the engineering attributes of a complete automobile (bus, car, truck, etc.).

The Development Engineer is also responsible for organising automobile level testing, validation, and certification. Components and systems are designed and tested individually by the Product Engineer. The final evaluation though, has to be conducted at the automobile level to evaluate system to system interactions. As an example, the audio system (radio) needs to be evaluated at the automobile level. Interaction with other electronic components can cause interference.

The design of modern cars is typically handled by a large team of designers and engineers from many different disciplines. As part of the product development effort the team of designers will work closely with teams of design engineers responsible for all aspects of the vehicle. These engineering teams include: chassis, body and trim, powertrain, electrical and production. The design team under the leadership of the design director will typically comprise of an exterior designer, an interior designer (usually referred to as stylists), and a color and materials designer. A few other designers will be involved in detail design of both exterior and interior.

**2. Match the beginning of the sentence with its end.**

1. Components and systems

2. Other designers

3. Automotive engineering

4. Automotive engineers

5. The design of modern

* 1. will be involved in detail design of both exterior and interior
	2. are involved in designing cars and truck
	3. is typically handled by a large team of designers.
	4. are designed and tested by the Product Engineer.
	5. is a branch of Vehicle engineering.

**3. Match the words to their definitions.**

1. Manufacturing engineer

2. Product engineer

3. Development engineer

* 1. is responsible for organizing automobile testing, certification.
	2. determines how to make the automobile.
	3. is involved in automobile designing testing.

**4. In pairs, ask and answer the following questions.**

1. What three main streams are automotive engineers separated into?

2. What does automotive engineering incorporate?

3. Are manufacturing engineers responsible for organising automobile level testing and certification?

4. What is typically handled by a large team of designers and engineers from many different disciplines?

**TEXT 3. AUTOMOBILE PRODUCTION**

**1. Match the English combinations with the corresponding Russian ones:**

* + 1. mechanical engineer
		2. to deal (with)
		3. designing cars
		4. to put into mass production
		5. long service life
		6. driving safety
		7. to meet up-to-date demands
		8. smooth-acting clutch
		9. silent gearbox
		10. dependable brakes and steering system
		11. to subject to tests
	1. долгий срок службы
	2. запустить в массовое производство
	3. подвергать испытаниям
	4. плавное сцепление
	5. отвечать современным требованиям
	6. иметь дело (с кем-л., чем-л.)
	7. надежные тормоза и рулевое управлеgние
	8. безопасность езды (вождения)
	9. бесшумная коробка передач
	10. инженер-механик
	11. конструирование автомобилей

**2. Read the text.**

Specialists in automobile industry deal with designing and manufacturing cars, so they should know that the production of the automobile comprises the following phases:

1) Designing,

2) Working out the technology of manufacturing processes,

3) Laboratory tests,

4) Road tests,

5) Mass production (manufacturing).

Why is it necessary to know all these facts?

It is important to know them as before the automobile (car or track) is put into mass production, it should be properly designed and the automobile must meet up-to-date requirements.

What are these requirements?

The automobile must have high efficiency, long service life, driving safety, ease of maintenance and pleasant appearance.

In order to obtain all these qualities engineers should develop up-to-date methods of designing cars, using new types of resistant to corrosion light materials. Also it is important to know computer science because it is intended to shorten the time between designing and manufacturing. Computers offer quick and optimal solutions of problems.

But before the car is put into mass production all its units and mechanisms are tested, first in the plant's laboratory, then the car undergoes a rigid quality control in road tests. Only then the car is put into mass production. Why are these tests required? What qualities are required of the automobile? The modern automobile must be rapid in acceleration, must have smooth acting clutch, silent gearbox, dependable brakes and steering system, as well as pleasant appearance. Also it must be comfortable and have all conveniences.

**3. Find the answers to the following questions. Write down the questions in the order they are asked.**

1. Why is it important for the specialists in automobile industry to driving safety, ease of maintenance and computing methods?

 2. What qualities are required of the automobile?

3. Why are cars subjected to road-tests?

4. What requirements must the automobile meet?

5. What phases does the production of the automobile comprise?

**4. Complete the sentences using the information from the text.**

1. The cars are subjected to road tests in order...

2. The car must have the following units...

3. The car must have the following qualities...

4. The production of the automobile comprises the following phases...

5. Engineers should develop up-to-date methods of...

**5. Work with a partner to label the types of car. What are they?**

* 1. Convertible
	2. Estate car ( station wagon)
	3. Hatchback
	4. Pick up
	5. Saloon( sedan)
	6. Sports car
	7. Limousine
	8. Coupe
	9. SUV(4x4)

**6. Which types of cars would you choose for your parents, friends and yourself? Justify your choice and compare it with your partner.**

**7. Speak about the modern automobile.**

JUST FOR FUN

**Read the text and fill in the gaps with the words from the list:**

|  |  |  |
| --- | --- | --- |
| *retake* *examiner**unfriendly* *backwards* | *underestimated overcrowded\crowded conductor* *disappointed*  | *useless* *luckily* *disbelief*  |

THE DRIVING TEST

I knew I would have to 1) ... my driving test as soon as I saw the 2) ... . He didn't even say "hello" and seemed very 3) ... .1 was a little bit late I suppose as I had slightly 4) ... how long it would take me to get there. As usual in this 5) ... city all the buses were packed and I had had to wait more than twenty minutes before a 6) ... would let me get on a bus. I knew apologizing would be 7) ... so I just got in the car. 8) ... I wasn't feeling particularly nervous but this horrible man stared at me in 9) ... as I began to drive off. I put the car into gear, but it went 10)... so fast I couldn't believe it-straight into the wall. I was so 11) ... when he told me I had failed that I thought I might cry.

**SECTION 4**

**MECHANICS OF MATERIALS**

**1. Scan the texts and find English equivalents for the following words.**

Твердое тело, ось, сопротивление материалов, внешняя сила, равновесие, внутренняя сила, статика, осевое (продольное) напряжение, деформация, нагрузка, сопротивление, жесткость, прочность, способность выдерживать нагрузку, планфункция, международная система единиц, циклическое нагружение, сосредоточенная нагрузка, ударная нагрузка, статическая нагрузка.

**TEXT 1. BASIC PRINCIPLES**

Mechanics of materials is the branch of applied mechanics that deals with the internal behavior of variously loaded solid bodies. The "solid bodies" referred to include shafts, bars, beams, and columns, as well as structures and machines that are assemblies of these components. Also called strength of materials or mechanics of deformable bodies, mechanics of materials focuses primarily on stress analysis and on the mechanical properties of materials.

The study of mechanics of materials is based upon an understanding of the equilibrium of bodies under the action of forces. While statics treats the external behavior of bodies that are ideally rigid and at rest, mechanics of materials is concerned with the relationships between external loads and internal forces and deformations induced in the body. Stress and strain are fundamental quantities connected with them.

Complete analysis of a structure under load requires the determination: stress, strain, and deformation through the use of three fundamental principles: the laws of forces, the laws of material deformation, and the conditions of geometric compatibility.

Investigation of the behavior of solids under loads began with Galileo Galilei (1564 - 1642), though Robert Hooke (1635-1703) was the first to point out that a body is deformed if a force acts upon it. Since then many engineers, scientists, and mathematicians in the field of stress analysis have developed the basic knowledge on which modern methods are based, and the literature related to the strength of materials is voluminous.

**TEXT 2. FORCE AND LOAD CLASSIFICATIONS**

All forces acting on a body, including, the reactive forces caused by supports, are considered external forces. These forces are classified as surface forces and body forces. A surface force is of concentrated type when it acts at a point, but it may also be distributed over a finite area. A body force acts on a volumetric element rather than on a surface and is attributable to fields such as gravity and magnetism. The force of the earth on an object at or near the surface is termed the weight of the object. Internal forces in a body can be considered as forces of interaction between the constituent material particles of the body.

The loads on bodies may be concentrated and distributed forces. Any force applied to an area is a concentrated load. A load slowly and steadily applied is regarded as a static load, while a rapidly applied load is called an impact load.

In the International System of Units, force is measured in newtons (N), but because the newton is a small quantity, the kilonewton (kN) is often used in practice. In the U.S. Customary System, force is expressed in pounds (lb) or kilopounds (kip).

**TEXT 3. SCOPE OF TREATMENT**

The usual objective of mechanics of materials is the examination of the load carrying capacity of a body from three standpoints: strength, stiffness, and stability. These qualities relate to the ability of a member to resist permanent deformation or fracture, to resist deflection, and to retain its equilibrium configuration. The stress level, sometimes expressed through failure theories which relates to the complex stresses in a structure with the experimentally obtained axial stress, is used as a measure of strength. Failure can be defined, in very general terms, as any action that results in an inability on the part of the structure to function in the manner intended.

The main concerns in the study of mechanics of materials may be summarized as follows:

1. Analysis of stress and deformation within a loaded body, which is accomplished by application of one of the methods.

2. Determination by analysis (or by experiment) of the largest load a structure can sustain without suffering damage, failure, or compromise of function.

3. Determination of the body shape and selection of those materials which are most efficient for resisting a prescribed system of forces under specified environmental conditions of operation. This is called the design function.

The ever-increasing demand for more sophisticated structural and machine components calls for the concepts of stress and strain and of the behavior of materials.

**2. Fill in the gaps with the words and right prepositions from the texts.**

1. A surface force is ... concentrated type when it acts ... a point, but it may also be distributed ... a finite area.

2. The design function is determination ... the body shape and selection ... those materials which are most efficient ... resisting a prescribed system ... forces ... specified environmental conditions ... operation.

3. The study ... mechanics ... materials is based ... an understanding ... the equilibrium ... bodies ... the action ... forces.

4. ... the International System of Units force is measured ... newton.

5. Mechanics ... materials focuses primarily ... stress analysis and ... the mechanical properties ... materials.

**3. Read the texts once again and answer the questions.**

1. What is mechanics of materials?

2. Give some examples of the solid bodies.

3. What are the fundamental quantities of mechanics of materials?

4. What is a surface force and body force?

5. What are three standpoints of the load carrying capacity of a body?

6. How can you characterize a failure?

**4. Complete the sentences using the information from the text.**

1. The usual objective of mechanics of materials is ...

2. The loads on bodies may be ...

3. Investigation of the behavior of solids under loads began with ...

4. Failure can be defined as ...

5. Mechanics of materials is the branch of...

6. Statics treats ...

**5. Make a plan of these 3 texts, no less than 5 points. Check your plans in class and then try to give the main idea of these texts: What is the mechanics of materials? (At least 10 sentences).**

**TEXT 4. APPLIED MECHANICS**

**1. Match the English terms with the corresponding Russian ones:**

|  |  |  |  |
| --- | --- | --- | --- |
| 1) | applied mechanics | a) | применять |
| 2) | a rigid body | b) | частица |
| 3) | negligible | c) | отношение |
| 4) | constant | d) | условие |
| 5) | dimensions | e) | законы механики |
| 6) | quantities | f) | движение |
| 7) | scale | g) | величины |
| 8) | particle | h) | масштаб, размер |
| 9) | to apply | i) | незначительный |
| 10) | laws of mechanics | j) | теоретическая механика |
| 11) | relation | k) | размеры |
| 12) | motion | l) | постоянный |

**2. Read the text.**

Mechanics is a branch of physical science which considers the effect of forces upon the motion or upon the conditions of material bodies.

Applied mechanics is a part of mechanics. It includes the laws of mechanics to be applied to the motions of particles and of rigid bodies as used in problems of engineering.

The condition of rest is considered to be the limiting condition of motion.

A particle is a body or a part of a body the dimensions of which are small and negligible when it is compared with its surroundings or with its range of motion, so that the force acting upon it may be localized at a point.

The subject of applied mechanics may be divided into two parts statics and dynamics, and dynamics may be further divided into kinematics and kinetics. It is statics that treats bodies in equilibrium, and dynamics that treats the particles and bodies in motion.

Kinematics is the part of dynamics to treat the motion of particles and rigid bodies without reference to the forces that produce or change the motion. Kinetics is the part of dynamics to treat the motion of material bodies which are changed by the application of forces. In order to understand thoroughly such a subject as applied mechanics, it is necessary for the student to solve a number of problems.

There are three common methods of analysis of problems: the graphic method, the trigonometric method and the algebraic one. In the graphic method, the quantities are represented by corresponding lines or areas; the relations between them are represented by the relations of the parts of the diagram.

In the trigonometric method, the quantities are represented by lines or areas as well but they are not necessarily drawn to scale.

In the algebraic method, quantities are represented by symbols; the relations between them are shown by signs indicating the operations; and the solution of the resulting equations is made by algebra.

**3. Complete the sentences with one possible answer.**

1. Mechanics is a branch of physical science which considers ...

a) the effect of radiation upon people and animals.

b) the effect of forces upon the motion or upon the conditions of material bodies.

c) the forms of transformation of energy connected with the movement of material systems under the action of force factor.

2. ... the quantities are to be represented by corresponding lines or areas; the relations between them are to be represented by the relations of the parts of the diagram.

a) In the algebraic method ...

b) In the graphic method ...

c) In the trigonometric method ...

3. ... is the part of dynamics to treat the motion of material bodies which are changed by the application of forces.

a) Kinetics

b) Kinematics

c) Statics

**3. Insert the preposition wherever necessary.**

1. Applied mechanics may be divided ... two parts statics and dynamics.

2. Statics treats ... bodies ... equilibrium.

3. A problem ... mechanics consists ... a statement ... certain known quantities and relations ... which certain other unknown quantities or relations are to be determined.

4. ... the trigonometric method, the quantities are to be represented ... lines or areas.

5. Understanding ... applied mechanics depends ... the ability ... students to solve a number ... problems.

**TEXT 5. PROPERTIES OF METALS AND THEIR USES**

*FOCUS VOCABULARY*

1. alloy – сплав;
2. steel – сталь;
3. strength – прочность;
4. ferrous – черный;
5. nonferrous – цветной;
6. toughness – жесткость;
7. bending – сгиб;
8. softness - мягкость, пластичность;
9. rusting – коррозия;
10. oxidation – окисление;
11. sharp melting point - четкая точка плавления ;
12. coefficient of expansion - коэффициент расширения;
13. breadth - ширина, степень, объем;
14. thickness – плотность;
15. specific gravity - удельный вес (масса);
16. specific density - удельная плотность;
17. electrical resistance - электрическое сопротивление;
18. mechanical properties - механические свойства;
19. sheathing – обмотка;
20. tensile strength - предел прочности, прочность на растяжение;
21. compressive strength - прочность на сжатие;
22. ductility - ковкостью
23. **Read the text.**

The selection of the proper metal or alloy for a given use is an important part of the practice of metallurgy. Because iron and steel are used in larger quantities than any of the other metals, it is common practice to divide materials into ferrous and nonferrous.

- Strength, ease of shaping and relatively low cost are of greatest importance for major structural purposes. For these purposes steel is ideally suited. For automobile parts, and wherever greater strength and toughness are required, more expensive special steels are used.

- Metals light in weight - For making different machine parts, and in other applications where strength must be combined with light weight, metals such as aluminum or magnesium and their alloys are used.

- Softness. Ease in bending - For uses requiring softness and ease in bending, as in cable-sheathing and where certain chemical properties are needed, lead and its alloys may be employed.

- Susceptibility to corrosion - Metals vary greatly in their susceptibility to atmospheric and chemical corrosion. The rusting of iron is the commonest example. - Oxidation or corrosion of those metals takes place at ordinary temperatures. Such metals as sodium, magnesium, zinc, iron, nickel, lead are difficult to obtain free in nature as they unite readily with other elements. And such metals as hydrogen, silver, copper and gold are found free in nature because they combine with other elements with difficulty. They do not corrode and are not easily oxidized.

- Melting Point - The melting point is the temperature at which a substance passes from a solid to a liquid condition. Pure substances have a sharp melting point, that is, they pass from entirely solid to entirely liquid form in a very small temperature range.

Alloys usually melt over a much wider temperature interval.

- Coefficient of expansion - With few exceptions, solids expand when they are heated and contract when cooled. They increase not only in length but also in breadth and thickness. The number of factors that shows the actual increase in unit length of a solid when it is heated one degree is called its "coefficient of expansion".

- Specific Gravity - Sometimes it is an advantage to compare the density of one metal with that of another. For such a purpose, we need a standard. Water is a standard that physicists have selected with which to compare densities of solids and liquids. The weight of a substance compared to the weight of an equal volume of water is called its specific density or specific gravity.

- Electrical resistance - The opposition to electric current as it flows through a wire is known as the resistance of the wire.

- Mechanical properties - Generally we are very much concerned with the mechanical properties of metals and alloys. The mechanical properties, such as hardness, tensile strength, compressive strength, and ductility are those measured by mechanical methods.



**2. Match words from the two columns to find the exterior car parts:**

front whiper

petrol light

head bumper

wheel cap

windscreen arch

number window

side pipe

exhaust plate

**3. Complete the sentences about materials and their properties with the following wordsю**

*Shatterproof \light \corrosion-resistant\ durable \elastic \natural \rigid \malleable*

* 1. Wood is very often used in interiors because it looks.. .and warm.
	2. Aluminum and magnesium are important in car manufacturing because they are.. .and therefore good for weight-saving.
	3. Rubber should be able to withstand great temperature differences while staying... In other words, it shouldn't become brittle.
	4. Windscreens are made of special... glass to protect drivers in accidents.
	5. Fabrics used in cars need to be... and not look old too quickly.
	6. Steel is used for load-bearing parts because it is...
	7. Sheet metal is used for large car parts because it is.. .and dent-resistant.
	8. Aluminum is ideal for bumpers and other body parts because it is...

*JUST FOR FUN*

**Read the text and fill in the gaps with the words from the list.**

*Ignition \ gear \ brake \ seatbelt \ accelerator \ pedal \ dashboard clutch pedal \ rear \ view \ mirror*

The first time I drove after passing my driving test, I was determined to get everything right. Got into the car, turned the key in the 1) ... and put my foot on the 2) ... while changing into first 3) ... Slowly I pressed down on the 4) ... and pulled out into the road. Driving along, I remembered to look at the petrol gauge on the 5) ... to make sure I had enough petrol.

Suddenly, a flashing light in the 6) ... caught my eye. There was a police car behind indicating that I should pull over, so I gently pressed on the 7) ... and stopped. Winding down the window, I asked the policeman what was wrong -1 had thought I was doing so well! His answer was very embarrassing: "You've forgotten to put on your 8) ..."

**SECTION 5**

**THE HISTORY OF THE AUTOMOBILE**

**TEXT 1. WHERE DOES THE WORD "AUTOMOBILE"**

 **COME FROM?**

*FOCUS VOCABULARY*

1. consist of - состоять из;
2. self-moving - самодвижущийся, самоходный;
3. arise from - обуславливаться;
4. unprovided - необеспеченный;
5. rails - железнодорожные пути;
6. substantially – значительно;
7. adapt for – приспособить;
8. cease – перестать;
9. luxury – роскошь;
10. decisive factor - решающий фактор;
11. solution – решение;
12. development – развитие;
13. road maintenance - содержание дорог;
14. improvement – усовершенствование;

**1. Read the text and do the following exercises.**

The word automobile is not English. It consists of two words: autos and mobilis. Autos is a Greek word meaning "self, mobilis" — a Latin word meaning "movable". The two words taken together mean "self-moving". Thus, an automobile means a self-moving vehicle.The synonyms of automobile are: auto, car, auto-car, motor car.

The role and importance of an automobile arise from the fact that it can move along roads unprovided with rails. In this respect, it substantially differs from a street car (tram) anda railway car (train). In fact, it often replaces street cars, railway cars, and other agencies of transportation and communication. In short, the automobile is a vehicle well adapted for ordinary road conditions.

The automobile has long since ceased to be a matter of luxury or sport and has become a decisive factor in the economic development of many countries. This accounts for the fact that the world at large uses a great number of automobiles. In some countries where automobiles are found in millions they are playing a most important part in the solution of many problems of transport.

The development of automobiles is also accountable to a large extent for the progressing road maintenance, improvement and construction.

**2. Find the synonyms to the word "automobile" in the text above.**

**3. Fill in the gaps with the suitable words and words-combinations from the text.**

1. An automobile means...

2. The role and importance of an automobile arise from the fact that it can ...

rails.

3. The automobile is a vehicle ... for ordinary road conditions.

4. The automobile has become... in the economic of many countries.

5. The development of automobiles is accountable for the progress in road...

**4. Answer the questions.**

1. What is the original of the word automobile?

2. What fact does the role and importance of the automobile arise from?

3. Why does the automobile play an important part in the economic development in many countries?

**TEXT 2. THE EARLY DAYS OF THE AUTOMOBILE**

*FOCUS VOCABULARY*

1. achievement – достижение;
2. single – один;
3. attempt – попытка;
4. mechanical power - механическая энергия;
5. propel - приводить в движение;
6. suggest – предлагать;
7. military engineer - военный инженер;
8. steam-driven engine - паровой двигатель;
9. three-wheeled carriage - трехколесный экипаж;
10. brake – тормоз;
11. gearbox - коробка передач;
12. opposition – сопротивление;
13. lag – отставать;
14. restriction – ограничение;
15. legislative act - законодательный акт;
16. outlaw – запрещать;
17. editor – редактор;
18. issue - издавать, выпускать;
19. appear – появляться;
20. escort – сопровождать;
21. prosecute – обвинять.

**1. Scan the text and find the names of famous scientists and their inventions.**

Like most other great human achievements, the motor car is not the product of any single inventor.

One of the earliest attempts to propel a vehicle by mechanical power was suggested by Isaac Newton. But the first self-propelled vehicle was constructed by the French military engineer Cugnot in 1763. He built a steam-driven engine which had three wheels, carried two passengers and ran at maximum speed of four miles per hour.

In 1784 the Russian inventor Kulibin built a three-wheeled carriage.In his vehicle he used for the first time such new elements as brakes, rollers and a gearbox.

In 1825 a steam engine was built in Great Britain. The vehicle carried 18 passengers and covered 8 miles in 45 minutes. However, the progress of motor cars met with great opposition in Great Britain. Further development of motor car lagged because of the restrictions resulting from legislative acts. The most famous of these acts was the Red Flag Act of 1865, according to which the speed of the steam-driven vehicles was limited to 4 miles per hour and a man with a red flag had to walk in front of it.

In Russia there were cities where motor cars were outlawed altogether. When the editor of the local newspaper in the city of Uralsk bought a car, the governor issued these instructions to the police: "When the vehicle appears in the streets, it is to be stopped and escorted to the police station, where its driver is to be prosecuted."

**2. Fill in the gaps with the words from the text and translate the sentences into Russian.**

1. Like most other great human, the motor car is not the product of....

2. In his vehicle Kulibin used for the first time such new elements as ..., ... and ...

3. The progress of motor cars... in Great Britain.

4. The speed of the steam-driven vehicles was... to 4 miles per hour and a man with a red flag ... front of it.

5. In Russia there were cities where.. .were outlawed altogether.

**3. What do these dates and figures refer to in the text?**

1865; 8; 1763; 45; 1825; 1784; 4; 3.

**4. Answer the questions.**

1. Is the motor car a product of a single inventor? 2. Whrn was the first self-propelled vehicle constructed? 3. Did the progress of motor cars meet with great opposition?

**5. Speak about the history of the automobile.**

**6. Label the parts of a car interior.**

****

**7. Match the numbers with the names of the instruments.**

****

**SECTION 6**

**CAR INDUSTRY AND ENVIRONMENT**

**TEXT 1. CARS: PASSION OR PROBLEM?**

*FOCUS VOCABULARY*

1. convenience – удобство;
2. exciting – увлекательный;
3. valuable – ценный;
4. produce – выпускать;
5. available – доступный;
6. entertainment – развлечение;
7. advertising – реклама;
8. cellular phone - сотовый телефон;
9. dozen – десяток;
10. traffic - уличное движение;
11. average speed - средняя скорость;
12. crowd – заполнять;
13. freeway - скоростная автомагистраль (без платы за проезд);
14. environmentalist - специалист по охране окружающей среды;
15. fuel – топливо;
16. protect – защищать;
17. gasoline – бензин;
18. parking lot - стоянка для автомобилей;
19. available – доступный;
20. believe – считать;
21. require – нуждаться;
22. pollute – загрязнять;
23. flight – полет;
24. solar-powered - работающий на солнечной энергии.

**1. Read the first paragraph of this text. Predict what the rest of the reading will be about, using the choices below. You can circle more than one answer. Then continue reading it.**

1. The convenience of cars

2. The excitement of cars

3. The development of cars

4. The danger of cars

For some people, the car is a convenient form of transportation. But for others,the car is an exciting hobby. Some people spend their lives collecting valuable cars.Others drive them in races, including the Mille Miglia in Italy, the Carrera Panamericana in Mexico, and the world-famous Indianapolis 500. For many people, cars are more than transportation. They are a source of passion and pleasure. Yet cars can also be a source of many problems.

In 1903, Henry Ford began selling the Model T car for $825. His company,Ford Motors, was the first to produce cars in large numbers. This made the car available to large numbers of people and helped them to travel long distances quickly and easily. The car has brought people much closer to places of work, study and entertainment.

Many people also work in car-related industries: fixing cars, washing cars, advertising cars and selling car products such as stereos and cellular phones.Most Americans buy a new car every five or six years. This means that one American may own a dozen cars in a lifetime. In fact, there are more cars than people in the United Slates. In New York City, 2.5 million cars move in and out of the city each day. In this traffic, the average speed is sometimes 8.1 miles per hour. This speed could easily be reached by riding a horse instead of driving a car. But New Yorkers continue to drive, just as people do in California, where freeways are often very crowded.

Some environmentalists believe that forms of public transportation such as buses and trains have not been fully developed in the United States. They try to teach others that public transportation saves fuel and helps to protect the environment.

Many people are unhappy with car traffic and pollution, as well as with the use of beautiful land for building new roads. One environmentalist, Jan Lundberg, left hisMercedes-Benz in Los Angeles and moved to the forests of northern California. There he works on the Auto-Free Times, a newspaper that teaches people how to live without driving. Lundberg travels on foot, on bicycle, or by bus. Before he decided to live without a car, Lundberg worked for the oil companies, studying the prices of gasoline.

Lundberg and other environmentalists dream of turning parking lots into parks and replacing cars with bicycles, but most people around the world believe that the car is a necessary part of life in today's world. Still, there is an important question that must be answered: What kind of fuel will we use when gasoline is no longer available? Lundberg believes that by the 2021, there will no longer be oil for gasoline makers to use. To solve this problem, car companies in Korea, Japan, Europe, and the United Stales are trying to develop an electric car that will not require gasoline at all.

The electric car is not a new idea. It had success with American women in the early 1900s.

Women liked electric cars because they were quiet and did not pollute the air.Electric cars were also easier to start than gasoline-powered ones. But gasoline powered cars were faster, and in the 1920s they became much more popular.

The electric car was not used again until the 1970s, when there were serious problems with the availability of oil. Car companies began to plan for a future without gasoline. The General Motors Company had plans to develop an electric car by1980; however, oil became available again, and this car was never produced.

Today there is a new interest in the electric car, which is partly related to a passion for speed and new technology. In 1977, engineer Paul MacCready, designed ahuman-powered airplane that successfully completed a three-mile flight. A similar airplane crossed the English Channel in 1977, followed by a solar-powered airplane.

In 1987, the Sun raycer, a solar-powered car, won a 2,000-mile race in Australia. As a result of this success, the General Motors Company began new work on the development of the electric car. The Toyota Company recently decided to spend $800 million a year on the development of new car technology. Many engineers believe that the electric car will lead to other forms of technology being used for transportation.

Cars may change, but their importance will not. Cars are important to nearly everyone, including engineers, businesspeople, environmentalists, and even poets.Poet Curt Brown believes that cars are part of our passion for new places and new experiences. According to Brown, this "very, very comfortable flying chair" will continue to bring us travel and adventure, no matter how it changes in the future.

**2. Number the following main ideas in the order they appear in the text.**

* 1. Soon there will be no oil to fuel cars.
	2. Cars, whether gasoline or electric powered, will always be important.
	3. Cars can cause problems.
	4. To some people, cars are more than transportation.
	5. Some environmentalists teach people how to live without cars.
	6. People in the U.S. need cars to go to school, to work, and to places of entertainment.

**3. Complete the following lists with information from the text.**

*Advantages of the car:*

1. Some people enjoy\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. People can travel\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. People are closer to\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Some people make money by\_\_\_\_\_\_\_\_\_\_\_\_

*Disadvantages of the car:*

1. Lots of traffic and\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Cars use more fuel than\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Beautiful land is replaced with\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Gasoline may no longer\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**TEXT 2. PLANNING FOR AN ENVIRONMENT-FRIENDY CAR**

**1. An environmentalist is someone who works to protect the environment: the air, land and oceans of the Earth. Read the article below. It describes a meeting of environmentalists who want to prepare for the future with fewer cars. Replace the underlined words and phrases with the words printed above the text.**

*Available convenient develop engineers fuel*

*Industries passion source technology valuable*

At a recent meeting of environmentalists, the problem of cars was discussed. Most environmentalists believe that in the future, there will be no more oil. This means that there will be no more **gasoline** for the cars that so many of us drive every day.

The environmentalists agreed that cars have made our lives **much easier and more comfortable.** But they believe that it is very important for **the people who are working on machines** to try and build new ones that will not require gasoline.

"We have always been good at **using science to create new machines"**, said one environmentalist. "This is **very important.** Our ability **to build and create** new forms of transportation will help us face a future without gasoline."

The environmentalists also discussed the importance of working with **businesses** to help them prepare for the future. " A world without gasoline means a world with fewer cars, added one man. "And this is good because it means less pollution. Maybe companies could find a way to pay extra money to workers who take buses or ride bicycles to work."

Most of the people at the meeting described their **deep love** for the Earth and their desire to keep it clean. They want to power cars by using solar or electric power as **the place where energy comes from**. Both of these create less pollution than gasoline, and they will continue to be **usable** in the future.

**2. What ideas did the environmentalists discuss at the meeting?**

**3. Environmental awareness will become increasingly important in the future. How environmentally-conscious are you?**

*Which students in the class do you think would answer "yes" to the following statements?*

*Ask them and see i f you were right.*

1. Fuel should be highly taxed.

2. I always find out i f my car has been manufactured in a plant with an eco-audit.

3. I consider the car's recyclability when I decide which new car to buy.

4. Introducing a speed limit on roads is a good idea.

5. A car's fuel consumption is a key priority when I buy a car.

**4. Read and translate the phrases used to talk about the future:**

* without doubt
* is quite likely
* I'm absolutely certain there's a good chance
* there's no doubt that we are convinced
* it's highly probable is expected to.

**5. Now use these phrases to discuss these statements in small groups:**

* in the next five/ten/twenty years...
* cars will have an auto pilot.
* sports cars will have a top speed of more than 300 km/h
* cars will use only one litre of petrol per 100 km.
* environmentally-friendly cars will be more important.
* cars will be like office with on-board computers and email facilities.

**6. Work with a partner. Prepare a short presentation of these topics. Look at the useful phrases for help with presentation language. Give your presentation to your fellow students.**

* I am going to be speaking about...
* There'll be time for questions at the end.
* Firstly/Secondly/Thirdly/Finally...
* Now we come to...
* In conclusion...
* Are there any questions?
1. Fuels of the future
2. The car of the future
3. The future of my company

**SECTION 7**

**SUPPLEMENTARY READING**

**Read the following texts and make the summaries. Useful phrases are given below.**

1. The object of this paper/ text is to present (to discuss, to describe, to show)...

2. The text discusses some problems relating to...

3. The paper begins with a short discussion on.. .At first, the author notes that (describes)...

4. Next (Further, Then) the author explains that... The next paragraph deals with (presents, discusses, describes)...

5. The final paragraph states (describes, ends with)...The conclusion is that the problem is ...

6. In my opinion ( To my mind, I think) .. .The text/ paper is interesting (not interesting), of importance (of little importance), valuable (invaluable), up-to-date (out-of-date), useful (useless) ...

**TEXT 1. THE CHANGING EXPECTATIONS**

**OF AUTOMOTIVE ENGINEERS**

*FOCUS VOCABULARY*

1. automotive engineer - инженер-механик, инженер-автомобилист;
2. to be associated with - быть связанным с…;
3. suspension system - система подвески;
4. door handle - дверная ручка;
5. venture - решиться, рисковать;
6. add-ons - дополнительные устройства;
7. highlight – придавать большое значение;
8. competitive quality - конкурентоспособное качество;
9. manufacturing capability - производственные (технологические) возможности;
10. software development - разработка программного обеспечения;
11. vehicle performance evaluation - оценка работы машины;
12. prior to – до;
13. computer simulation - компьютерное моделирование;
14. compliance – соответствие;
15. regulations - технические нормы.

In the past, automotive engineers were closely associated with the field of mechanical engineering. After all, most automotive engineers dealt with topics such as gasoline and diesel engines, transmissions, suspension systems, chassis, door handles,seats, etc. A few ventured off into new developments such as turbine gas engines, continuously variable transmissions, or even Sterling engines. Some dealt with plastics and painting systems. The vast majority of knowledge needed by the automotive engineer of the past was mechanical in nature.

The reality of today is that the automotive engineer knows about far more than just mechanical engineering. To attract the best, the industry needs to project an image of the automotive engineer as someone with skills and knowledge beyond mechanical engineering.

The modern automobile has often been described as a computer on wheels. It is that and more — much more. Electronics control component systems such as the engine,transmission, and brakes. Those controls have become not just add-ons but integral parts of the operation of each system and the whole vehicle. A focus is on intelligent vehicle technology, which highlighted the integration of more electronics into the vehicle.

No longer can design engineers "throw their designs over the wall" to the manufacturing engineer. The design engineer must know enough about the manufacturing capability of his/her organization or supplier, and the manufacturing engineer must be an early participant in the design team. Competitive quality and cost require that the design specifications match the manufacturing capability. Empty promises by manufacturing ("give us a design and we will build it") are no longer accepted.

Software development is not only necessary to achieve optimum operation of each vehicle computer, but vehicle performance evaluation prior to design is becoming standard practice. Computer simulation for demonstrating compliance with regulations will probably be widely accepted in the not-too-distant future.

**TEXT 2. METALS**

*FOCUS VOCABULARY*

1. lattice – решетка;
2. metalloid - металлоид, полуметалл;
3. nonmetal – неметалл;
4. boron – бор;
5. polonium – полоний;
6. copper – медь;
7. iron – железо;
8. lead – свинец;
9. conductance – проводимость;
10. valence band - валентная область (зона);
11. ductile – эластичный; .
12. malleable – ковкий;
13. alkali – щелочь;
14. hydrochloric acid - хлористоводородная кислота.

In chemistry, a metal (Greek: Metallon) is an element that readily forms ions and has metallic bonds, and metals are sometimes described as a lattice of positive ions in a cloud of electrons. The metals are one of the three groups of elements as distinguished by their ionization and bonding properties, along with the metalloids and nonmetals. On the periodic table, a diagonal line drawn from boron (B) to polonium (Po) separates the metals from the nonmetals. Elements on this line are metalloids, sometimes called semimetals.Elements to the lower left are metals. Elements to the upper right are nonmetals.

Some well-known metals are aluminum, copper, gold, iron, lead, silver, titanium,uranium, and zinc.

A more modern definition of metals is that they have overlapping conductance and valence bands in their electronic structure. This definition opens up the category for metallic polymers and other organic metals, which have been made by researchers and employed in high-tech devices.

Aluminum is a metallic chemical element. It is ductile, malleable, and an excellent conductor of heat and electricity. The pure metal is soft. It becomes strong and hard when alloyed. Although it is chemically very reactive, aluminum resists corrosion. It is rapidly attacked by alkalies and by hydrochloric acid.

Important alloys of aluminum include duralumin, aluminum bronze, and aluminum-magnesium. They are used extensively in aircraft and other industries.

**TEXT 3. ALLOYS**

*FOCUS VOCABULARY*

1. alloy – сплав;
2. property – свойство;
3. homogeneous – однородный;
4. heterogeneous – неоднородный;
5. tiny – маленький;
6. compound – соединение;
7. carbon – углерод;
8. hardening agent - отверждающий реагент;
9. brittle – хрупкий;
10. advent of furnaces - появление печей;
11. damascus steel - булатная сталь;
12. tensile – растяжение;
13. stainless steel - нержавеющая сталь.

Alloy is a substance with metallic properties that consists of a metal fused with one or more metals or nonmetals. Alloys may be a homogeneous solid solution, a heterogeneous mixture of tiny crystals, a true chemical compound, or a mixture of these. Alloys are used more extensively than pure metals because they can be engineered to have specific properties.

New alloys are being engineered for use in new technology, including materials for the space program.

Steel is a metal alloy whose major component is iron and carbon. Carbon acts as a hardening agent. Steel with increased carbon content can be made harder and stronger than iron, but is also more brittle.

Currently there are several classes of steels in which carbon is replaced with other alloying materials. A more recent definition is that steels are iron-based alloys that can be plastically formed.

There are different types of steels. Chromium steel finds wide use in automobile and airplane parts on account of its hardness, strength, and elasticity, as does the chromium-vanadium variety. In a modern sense, alloy steels have been made since the advent of furnaces capable of melting iron, into which other metals may be thrown and mixed.Also there exist Carbon steel and Damascus steel, which was famous in ancient times for its flexibility.

Nickel steel is the most widely used of the alloys. It is nonmagnetic and has the tensile properties of high-carbon steel without the brittleness.Stainless steels and surgical stainless steels contain a minimum of 10.5% chromium,often combined with nickel, to resist corrosion. Some stainless steels are nonmagnetic.There are tool steels, H S L A Steel (High Strength, Low Alloy) and ferrous superalloys.

**TEXT 4. DEFINITIONS**

*FOCUS VOCABULARY*

1. internal distribution of force- внутреннее распределение силы;
2. tensor quantity - тензорная величина;
3. compressive stress - сжимающее напряжение;
4. uniaxial compression - одноосное, линейное сжатие;
5. tensile stress - растягивающее напряжение;
6. tensile loading - растягивающая нагрузка;
7. shear stress - касательное напряжение;
8. compressive strength - прочность при сжатии;
9. compressive failure - разрушение при сжатии;
10. ductile failure - пластическое разрушение;
11. brittle failure - хрупкое разрушение;
12. tensile strength - прочность на растяжение;
13. tensile failure - разрушение при растяжении;
14. displacement field - поле перемещений;
15. strain - напряжение, растяжение;
16. quotient - коэффициент, показатель;
17. hook's law - закон Гука;
18. plasticity – пластичность;
19. irreversible transformation - необратимое преобразование;
20. viscosity – вязкость;
21. creep – ползучесть;
22. elastic deformation (viscoelasticity) - упругая деформация;
23. plastic deformation (viscoplasticity) - пластичная деформация.

**Stress terms:**

Stress is the internal distribution of forces within a body that balances and reacts to the loads applied to it. It is a complicated tensor quantity that can be broken down into simpler elements for engineering purposes:

• Compressive stress (or compression) is the stress state when the material tends to compact (volume decrease). A simple case of compression is the uniaxial compression induced by the action of opposite, pushing forces. Most materials can carry compressive stress.

• Tensile stress is a loading that tends to produce stretching on a material by the application of axially directed pulling forces. Materials can withstand some tensile loading, but i f enough force is applied, they will eventually break into two parts.Steel is an example of a material with high tensile strength.

• Shear stress is caused when a force is applied to produce a sliding failure of a material along a plane that is parallel to the direction of the applied force e.g. when cutting paper with scissors or a steel bolt with a bolt cutter.

***Strength terms:***

• Compressive strength is a limit state of compressive stress that leads to compressive failure in the manner of ductile failure or in the manner of brittle failure.

• Tensile strength is a limit state of tensile stress that leads to tensile failure in the manner of ductile failure or in the manner of brittle failure (sudden breaking in two or more pieces with a low stress state).

***Strain - deformation terms:***

• Deformation of the material is the change in geometry when stress is applied. Deformation is expressed deformation change among the material field. For uniaxial loadings - displacements of a specimen it is expressed as the quotient of the displacement and the length of the specimen.

***Stress - strain relations:***

• Elasticity is the linear response of materials in terms of stress and strain as described by Hook's law. Elasticity describes the state where the work offered by the application of external agents (forces), is stored in the material in form of elastic energy. It is recovered in form of displacement when external agents are removed.

• Plasticity is the non-linear response of materials in terms of stress and strain. Plastic behaviour includes the irreversible transformation of work offered by the application of external agents (forces) to forms of energy such as thermal energy or crack propagation-growth. When the agents are removed, the deformation remains.

• Viscosity is the non-linear time dependent response of materials in terms of stress and strain. The most known form of viscosity in solid mechanics is creep. Viscosity in solids may include elastic deformation (Viscoelasticity) or/and plastic deformation (Viscoplasticity).

**TEXT 5. THE FIRST APPEARANCE**

**OF THE AUTOMOBILE**

*FOCUS VOCABULARY*

1. steam – пар;
2. tricycle - трехколесный автомобиль;
3. prevail – преобладать;
4. appear – появляться;
5. storage battery - аккумуляторная батарея;
6. forerunner – предшественник;
7. gasoline-powered engine - бензиновый двигатель;
8. horseless carriage - самодвижущийся экипаж;
9. hand-crank - заводная рукоятка, ручка;
10. mount – устанавливать;
11. steering - рулевое устройство;
12. tiller - рулевой рычаг;
13. gear – передача;
14. tire – шина;
15. rubber – резина;
16. smelly – пахучий;
17. shock absorber – амортизатор;
18. luxury – роскошь;
19. spark plug - свеча зажигания;
20. reliable braking - надежное торможение;
21. front suspension - передняя подвеска;
22. large-scale production - крупномасштабное производство;
23. seat adjuster - регулятор положения сиденья;
24. ignition system - система зажигания;
25. fuel efficiency - топливная экономичность;
26. passenger safety - безопасность пассажиров;
27. global positioning system (GPS) - глобальная навигационная спутниковая система;
28. locator beacons - приводной маяк.

About 8,000 cars were registered in America at the start of the 20 century. There are now some half billion in the world, one-third in the United States, where more than 1.5 trillion miles are traveled each year.For hundreds of years, humans have attempted to develop means for faster, more economical travel. Vehicles have been powered by humans and animals. In 1769, Frenchman Nicolas-Joseph Cugnot built the first automobile. It was actually a steam-powered tricycle. During the 19th century, steam power prevailed.

Electric cars appeared in the late 1800s. Cleaner than steam-powered cars, they had a large bank of storage batteries under the hood. They could travel at 10 to 20 miles per hour for a distance of 50 miles before the batteries needed recharging. In the second half of the 19th century, Siegfried Marcus of Austria created the forerunner of the modern automobile. German engineer Gottlieb Daimler put a gasoline-powered engine on a bicycle.Karl Benz followed with the first gasoline car.

By 1900 a typical automobile in the United States looked something like this: It was shaped like a box, much like a horseless carriage. There was little protection from rain, dust, or other hazards. It was started by a hand-crank. Engines were mounted under the body, and steering was often by tiller. All of the parts including the gears and drive systems were exposed to the elements. Early tires were solid rubber. The arrival of pneumatic tires made the ride more comfortable. Kerosene side lamps and smelly acetylene headlamps lit the traveler's way. There were no shock absorbers or heating systems.People who drove autos in the early days were seen as heroic adventurers.

By 1900 there were 50 automobile-manufacturing companies.Engineers of that century began to enhance the popularity of the car and improve its safety. They included the electric starter in 1911. It was introduced by Charles Kettering.

By the middle of 1920s, other innovators were changing the industry. William Durant sur passed Ford in sales by offering variety. He began buying different car firms that built to different tastes - luxury, speed, comfort, and utility. The first were Olds, Oakland(later the Pontiac), and Cadillac. Then he bought out makers of motors, spark plugs, and other components and accessories. All this resulted in the General Motors Company, the forerunner of the modern automotive operation.

The 1930s saw more reliable braking, higher-compression engines, and theworld's first diesel engine by Mercedes. Automobile engines were becoming larger, and many had 12 and 16 cylinders. Independent front suspension was added to make larger cars more comfortable.

Large-scale production began in the early 1950s. New automotive features included air conditioning, electrically operated car windows, seat adjusters, and a change from a 6-volt to a 12-volt ignition system which improved engine performance. Cars increased in size and weight, but power steering and brakes made them easier to handle.

In the early days of the car, the biggest worry was keeping it running. Today we are concerned with aerodynamic designs for speed and fuel efficiency, passenger safety issues, and pollution control systems. In 1900 a car might have a total of 100 parts, while today it has some 14,000. Accessories can include CD players, tape decks, television and phone installations, and separate sound and temperature controls in the front and back of a vehicle. Some cars are equipped with satellite-aided global positioning system (GPS) locator beacons.

In one form or another, the vehicle has become the major transporter of people and goods in the world. Its basic design and power systems have been widely adapted to vehicles such as the ambulance, jeep, police car, minivan, limousine, pickup truck, and tractor trailer.

**TEXT 6. THE AUTOMOBILE LIFE CYCLE**

*FOCUS VOCABULARY*

1. conclude – заканчиваться;
2. scrapping - сдача в лом;
3. approximately – приблизительно;
4. account for – составлять;
5. environmental impact - воздействие на окружающую среду;
6. acquisition – добывание;
7. processing – переработка;
8. consumption – потребление;
9. copious amounts - огромное количество;
10. involve – включать;
11. release - выделять, выпускать;
12. assembly plant - сборочный завод;
13. pollutant - загрязняющее вещество;
14. coating – покрытие;
15. wastewater - сточные воды;
16. trash – мусор;
17. scrap metal – металлолом;
18. emission - выброс, выделение.

The life cycle of an automobile begins with concept and design and concludes with retirement (end-of-life scrapping). Today, a vehicle consists of approximately 15000 parts. Steel, iron, glass, textiles, plastic, and non-ferrous metal dominate automobile construction. They account for more than 80% of the material used in today's vehicles. A common trend in the material composition of a car is toward increasing the use of lightweight materials, especially numerous types of plastics and light metal alloys (such as aluminum and magnesium). The environmental impacts and concerns that arise from the acquisition and processing of virgin resources that serve as input for automotive material include the substantial consumption of resources (material and energy). In addition, copious amounts of energy are consumed in heating, cooling, and producing millions of tons of steel, aluminum, plastic, and glass. Processing these materials involves a variety of heavy metals, toxic chemicals, chlorinated solvents, and ozone depleting chemicals.More than half of all releases and transfers of pollutants originate from the painting and coating operations. The largest solid waste streams generated by an automobile assembly plant are wastewater treatment sludges, waste oil, plant trash, and scrap metal. The utilization of an automobile accounts for approximately 80% of the total primary energy consumption of the life cycle of an automobile. Most of the C02 and CO emissions are released during the utilization. Besides the resource consumption when running a vehicle and the necessary infrastructure (e.g. highways, service- and gas stations), the maintenance and service operations contribute significantly to the environmental effects of automobile use.

Opportunities for environmental improvement exist during each life-cycle stage of an automobile. Significant changes in the material and process selection and management are necessary to reduce the overall environmental impact throughout the entire life cycle of an automobile.

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