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Данное учебное пособие предназначено для студентов 2-го курса АВТФ, ФПМИ, ФЛА, МТФ, ФТФ, РЭФ, ФЭН, ФМА для использования на занятиях в рамках дисциплины «Иностранный язык».

Целью пособия является развитие лексических навыков, а также навыков чтения, говорения, аудирования и письма при обучении английскому языку. Учебное пособие включает 2 модуля: «Information Technology (Информационные технологии» и «Fundamentals of Engineering (Основы инженерного дела)». Организация пособия предполагает формирование речевых умений от первичных навыков употребления специальной лексики в речи до упражнений, которые способствуют формированию коммуникативной компетенции, подготавливают студентов к диалогической и монологической речи.

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MODULE I

INFORMATION TECHNOLOGY

Unit 1

COMPUTERS

Topical vocabulary

1. computer (n)	компьютер
personal computer (PC) (n)	персональный компьютер (ПК)
desktop (adj)	настольный
workstation (n)	рабочая станция
2. server (n)	сервер
3. supercomputer (n)	суперкомпьютер
parallel processor (n)	многопроцессорная система с параллельной обработкой данных
4. portable (adj)	портативный, переносной
laptop (n)	ноутбук
netbook (n)	нетбук
tablet (n)	планшет
5. hardware (n)	аппаратное обеспечение
6. process (v)	обрабатывать
processor (n)	процессор
central processing unit (CPU) (n)	центральный процессор (ЦПУ)
7. core (n)	ядро
8. computational power (n)	вычислительная мощность
9. speed	быстродействие
10. main memory (n)	основная память
random access memory (RAM) (n)	оперативная память (ОЗУ)
read-only memory (ROM) (n)	память только для чтения (ПЗУ)
volatile / non-volatile (n)	энергозависимый/энергонезависимый
11. peripheral (n)	периферийное устройство
12. attach (v)	присоединять, подключать
13. input device (n)	устройство ввода
keyboard (n)	клавиатура
mouse (n)	мышь
touchpad (n)	сенсорная панель
14. output device (n)	устройство вывода
display (v)	отображать
monitor (n)	монитор
screen (n)	экран

touchscreen (n)	сенсорный экран
15. storage device (n)	устройство хранения данных
store (v)	хранить
storage capacity (n)	ёмкость запоминающего устройства
flash drive (n)	флеш-накопитель
hard disk (n)	жесткий диск
16. specs (n)	технические характеристики
17. software (n)	программное обеспечение
data (n)	данные
18. operating system (n)	операционная система
19. interface (n)	интерфейс
graphical user interface (GUI) (n)	графический интерфейс пользователя
icon (n)	пиктограмма, иконка
interact (v)	взаимодействовать
20. application (n)	прикладная программа, приложение

1.1 Read the following quotes

“I think there is a world market for maybe five computers.” (*Thomas Watson, Chairman of IBM, 1943*)

“Computers in the future may weigh no more than one-and-a-half tons.” (*Popular Mechanics, 1949*)

“There is no reason anyone in the right state of mind will want a computer in their home.” (*Ken Olson, President of Digital Equipment Corp, 1977*)

Is the situation at present different from what it was like and from what was predicted at the time these words were said? What has changed and why?

1.2 Read the text and fill in the table

What I knew before reading the text	What I learned from the text	What made me look at what I knew from a different angle
1. ...	1. ...	1. ...

WHAT IS A PC?

It's impossible to imagine life without a computer nowadays. From work to entertainment, these machines have become an integral part of our daily lives.

The word *computer* refers to an object that can accept some input and produce some output. Our most common use of the word *computer*, though, is to describe an electronic device containing a microprocessor.

A microprocessor is a small electronic device that can process data in the blink of an eye. You can find microprocessors in many devices you use each day, such as cars, refrigerators

and televisions. The most recognized device with a microprocessor is the personal computer, or PC.

Here, we define a PC as a general computing device with these characteristics:

- designed for use by one person at a time
- runs an operating system to create an interface between the user and the microprocessor
- has certain common internal components like a CPU and RAM
- runs software applications designed for specific work or play activities
- allows for adding and removing hardware or software as needed.

In 1981, iconic tech maker IBM unveiled its first PC, which relied on Microsoft's now-legendary operating system – MS-DOS (Microsoft Disk Operating System). Not to be left behind, Apple, in 1983, introduced the Lisa, marking one of the first instances of a PC equipped with a graphical user interface (GUI). This meant that for the first time, users could interact with on-screen icons rather than a bland text interface.

Over the years, advancements in hardware components like the central processing unit (CPU) and random access memory (RAM) have skyrocketed. These leaps in technology allowed for an exponential increase in computing power. For instance, in 1986, Compaq introduced a 32-bit CPU in its 386 machines, and in 1993, Intel unveiled its first Pentium processor.

Modern personal computers have evolved to include touchscreens, a myriad of built-in connectivity options like Bluetooth and WiFi, and ever-evolving operating systems. The physical form of these machines, from desktop computers to portable laptops, has also seen significant transformations. Today, PCs are more than just tools for data processing or playing games; they're integral to countless aspects of daily life, from scientific research to weather forecasting.

1.3 Answer the following questions

1. What is the scope of using computers nowadays?
2. What do personal computers have in common with modern cars, refrigerators, and televisions?
3. What are the defining characteristics of a PC?
4. What is the function of an operating system?
5. How did the Lisa introduced by Apple differ from the first IBM PC?
6. What technological advancements can be found in modern computers?

1.4 Find the English equivalents of the following phrases in the text

1. невозможно представить
2. неотъемлемая часть нашей повседневной жизни
3. электронное устройство с микропроцессором
4. в мгновение ока
5. предназначенный для индивидуального пользования
6. использовать прикладное программное обеспечение

7. позволяет добавлять и удалять аппаратное и программное обеспечение по необходимости
8. работать на теперь уже легендарной операционной системе
9. оснащенный графическим интерфейсом пользователя
10. экспоненциальный рост вычислительной мощности
11. претерпеть значительные изменения
12. инструмент для обработки данных

1.5 Find words in the text whose meaning is similar to the meaning of the following words

- | | | | | |
|-----------|-----------------|----------------|-----------------|----------------|
| 1. usual | 3. to introduce | 5. to supply | 7. element | 9. alternative |
| 2. to use | 4. example | 6. improvement | 8. breakthrough | 10. instrument |

1.6 Find words in the text whose meaning is opposite to the meaning of the following words

- | | | | | |
|--------------|-------------|-------------|------------|----------------|
| 1. to reject | 3. specific | 5. to add | 7. to fall | 9. to decline |
| 2. unknown | 4. external | 6. exciting | 8. ancient | 10. negligible |

1.7 a) Match the adjectives / nouns and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Adjective / Noun	Noun
1. integral	a) unit
2. daily	b) transformations
3. electronic	c) system
4. personal	d) research
5. operating	e) power
6. internal	f) part
7. software	g) lives
8. user	h) interface
9. on-screen	i) increase
10. processing	j) icons
11. random	k) device
12. exponential	l) computer
13. computing	m) components
14. significant	n) applications
15. scientific	o) access

b) Match the verbs and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Verb	Noun
1. to imagine	a) data

- | | |
|---------------|------------------------|
| 2. to become | b) games |
| 3. to accept | c) input |
| 4. to produce | d) an interface |
| 5. to contain | e) life |
| 6. to process | f) a microprocessor |
| 7. to run | g) an operating system |
| 8. to create | h) output |
| 9. to see | i) a part |
| 10. to play | j) transformations |

1.8 Find the corresponding prepositions for the following verbs in the text. Make sentences of your own where the verbs are used in combination with the prepositions

- | | |
|-------------------------------------|------------------------------------|
| 1. to refer / to be referred _____ | 5. to leave / to be left _____ |
| 2. to design / to be designed _____ | 6. to equip / to be equipped _____ |
| 3. to allow _____ | 7. to interact _____ |
| 4. to rely _____ | |

1.9 Match the different types of computers and their descriptions

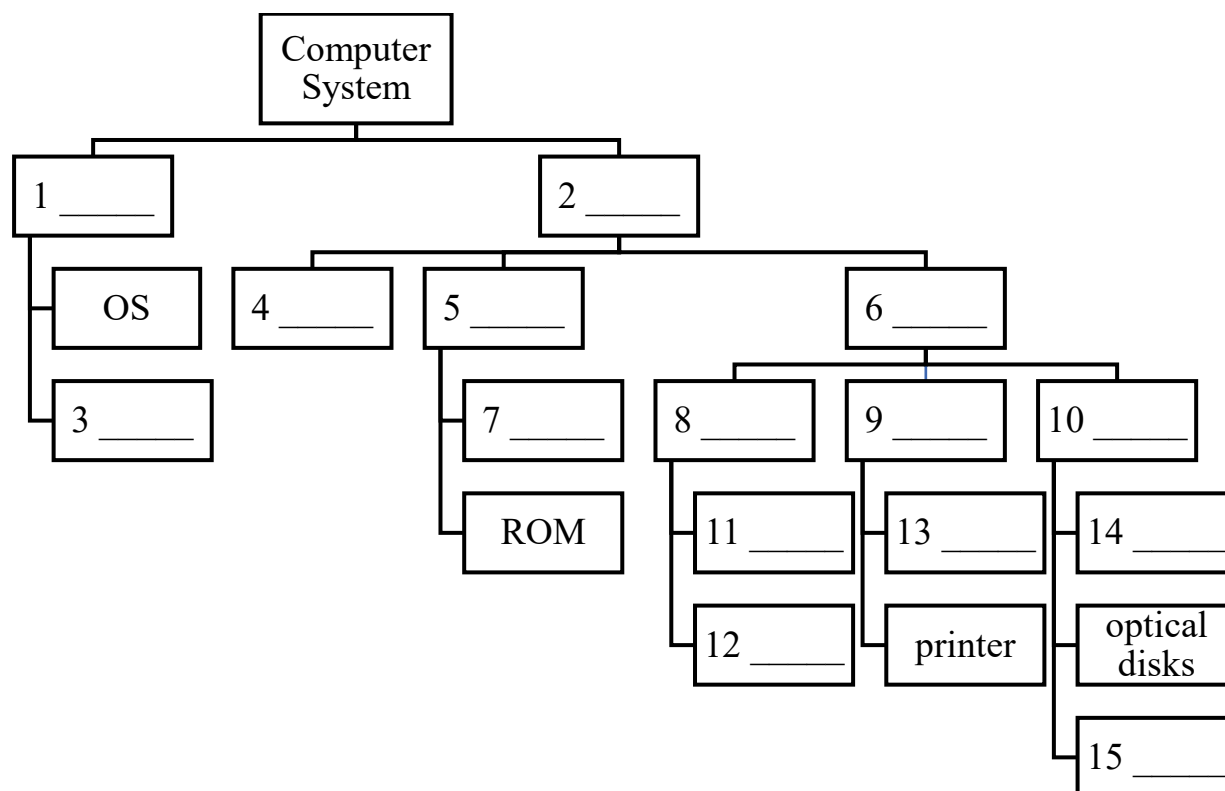
Computer type	Description
1. PC	a) a thin, flat device with a touchscreen interface
2. desktop	b) a computer that has been optimized to provide services to other computers over a network
3. laptop	c) a powerful computer with enhanced capabilities for performing a special group of tasks, such as 3D graphics or game development
4. netbook	d) an extremely powerful machine composed of multiple high-performance computers working in parallel as a single system
5. tablet	e) a computer of a size designed to be used on a desk or table
6. workstation	f) an ultra-portable computer used primarily as a means for accessing the internet and web-based applications
7. server	g) a portable computer that integrates the display, keyboard, a pointing device or trackball, processor, memory and hard drive all in a battery-operated package
8. supercomputer	h) a computer designed specifically for individual use

1.10 Translate into English

- Компьютеры значительно отличаются друг от друга вычислительной мощностью, быстродействием, объемом памяти и физическим размером.
- Портативные компьютеры и настольные ПК обычно используются на предприятиях и дома для связи посредством компьютерных сетей, работы и развлечений.

3. Они обладают большим объемом встроенной памяти для хранения сотен программ и документов.
4. Они оснащены клавиатурой, мышью или сенсорной панелью, а также монитором для отображения информации.
5. Рабочие станции похожи на персональные компьютеры, но имеют больший объем памяти и более широкие математические возможности, а также подключаются к другим рабочим станциям или персональным компьютерам для обмена данными.
6. Рабочие станции обычно используются в научной, промышленной и деловой среде, где требуются сложные и быстрые вычисления.
7. Самые мощные компьютеры, называемые суперкомпьютерами, выполняют сложные и трудоемкие вычисления, например, те, которые используются для составления прогнозов погоды.
8. В некоторых суперкомпьютерах установлены множество процессоров.
9. Эти компьютеры разбивают задачу на небольшие части, и каждый процессор обрабатывает свою часть задачи, таким образом повышая общее быстродействие и эффективность.
10. Такие компьютеры называются многопроцессорными системами с параллельной обработкой данных.

1.11 Fill in the diagram of a computer system.



Listen and check

1.12 Listen again and fill in the table

Part of a computer system	Characteristics and functions
1.	programs that enable a computer to perform a specific task
2. hardware	
3.	processor chip which executes program instructions and coordinates the activities of all the other components
4.	holds the instructions and the data which are currently being processed by the CPU
5.	loses the stored data when the electricity – or power – is turned off
6.	non-volatile
7. peripherals	
8. input devices	
9. output devices	
10. storage devices	

1.13 Answer the following questions

1. Do you have a computer?
2. What type is it?
3. What are its characteristics?
4. Would you like to upgrade your computer?
5. Why / why not?
6. What would you like to upgrade?

1.14 Complete the conversation between the sales assistant and a customer of a computer shop by using the words from the list below. Try to summarize the content of the conversation in 50 words or less

bigger both cheaper cost feature more reliable running specs storage

Sales assistant: Hi there. Do you need any help or are you just looking?

Customer: Actually, yes, you might be able to help. I'm looking for a new laptop. Have you got any that are really **1** _____? I've had loads of problems with the one I've got at the moment.

Sales assistant: OK. Well, it'll depend on your budget, but we've got two with 20% off at the moment – the HONOR MagicBook X 16 2024 Pro and the Acer Aspire 3.

Customer: Right. And what's the difference between these two? Do they have similar **2** _____?

Sales assistant: Well, the Acer's more of an entry-level model. It's got a 4-core Intel Processor N100 **3** _____ at 3.5Ghz, which is fast enough for most applications, although you might struggle if you want to play really advanced games on it. The HONOR's got the 8-core Intel Core i5-13420H processor which is really fast. The HONOR also has twice as much RAM as the Acer – that's 16GB as opposed to 8.

Customer: OK and what's the **4** _____ capacity of each model?

Sales assistant: OK, that's 256GB SSD for the Acer and 512GB SSD for the HONOR.

Customer: Mm. That's quite a difference, isn't it? Is there anything else I should know about?

Sales assistant: Well, they **5** _____ come fully wireless and Bluetooth-enabled, and Windows 11 is now standard on all the laptops we sell. They also both **6** _____ built-in web cameras, so videoconferencing is a matter of a click. The HONOR has a slightly **7** _____ screen, but it weighs as much as the Acer, which would make them equally practical if you plan to travel with your laptop.

Customer: OK and how much do they **8** _____?

Sales assistant: Let me just have a look. The Acer's quite a bit **9** _____ than the HONOR – it's \$439.99 compared to \$739.99. But the HONOR is much **10** _____ powerful – it's got twice the RAM and a faster processor.

Customer: Yeah, but I just can't afford that much. I think I'll take the Acer.

1.15 Act out a dialogue “Buying a Computer”. Use the following as a prompt

Customer	Sales Assistant
1. Think of what you need the computer for 2. Keep in mind your budget	1. Consider the customer's needs 2. Offer at least two models to choose from. Explain the advantages of each model

Unit 2

THE INTERNET

Topical vocabulary

1. network (n)	сеть
2. link (v)	соединять
3. modem (n)	модем
router (n)	маршрутизатор
wireless (adj)	беспроводной
4. broadband (adj)	широкополосный
5. the Internet (n)	Интернет
6. Internet service provider (ISP)	поставщик услуг в сети Интернет, интернет-провайдер
7. access (n)	доступ
access (v)	осуществлять доступ к, подключаться
8. IP address (n)	сетевой адрес
9. email (n)	электронная почта
attachment (n)	вложение
junk mail / spam (n)	нежелательная почта / спам
10. file transfer (n)	передача файлов
11. instant messaging (n)	мгновенный обмен сообщениями
12. web (n)	паутина
the World Wide Web (WWW) (n)	Всемирная паутина
13. hyperlink (n)	гиперссылка
Hypertext Transfer Protocol (HTTP) (n)	протокол передачи гипертекста
14. website (n)	вебсайт
website address (n)	адрес вебсайта
domain name (n)	доменное имя
Hypertext Markup Language (HTML) (n)	язык разметки гипертекста
15. web browser (n)	обозреватель Интернета, веб-браузер
16. enable (v)	позволять, давать возможность
chat (v)	общаться
check (v)	выяснять, проверять
download (v)	скачивать, загружать на компьютер
exchange (v)	обмениваться
order (v)	заказывать
share (v)	делиться, распространять
17. social network (n)	социальная сеть

18. streaming media (n)	потокковое мультимедиа
broadcast (n)	вещание, трансляция
live (adj)	в прямом эфире
on demand (adj)	по запросу
podcast (n)	аудиоролик, подкаст
subscription (n)	подписка

2.1 Read the following quotes

“The ‘Net is a waste of time, and that’s exactly what’s right about it.” (*William Gibson, New York Times Magazine, 14 July 1996*)

“Don’t believe anything you read on the net. Except this. Well, including this, I suppose.” (*Douglas Adams*)

“The Internet is not something we have, it’s something we do.” (*Hank Green*)

Do you agree with the quotes? Why / why not?

2.2 Read the text and fill in the table

What I knew before reading the text	What I learned from the text	What made me look at what I knew from a different angle
1. ...	1. ...	1. ...

WHAT IS THE WORLD WIDE WEB?

The World Wide Web is used by millions of people every day for everything from checking the weather, ordering food, and chatting with friends to raising funds, sharing news, or starting revolutions. We use it from our computers, our phones, even our cars. It’s just there, all around us, all the time. But what is it exactly?

First of all, the World Wide Web is not the Internet, even though the terms are often used interchangeably. The Internet is simply the way computers connect to each other in order to share information. When the Internet first emerged, computers actually made direct calls to each other. Today, networks are all around us, so computers can communicate seamlessly. The communication enabled through the Internet has many uses, such as email, file transfer, and conferencing. But the most common use is accessing the World Wide Web.

Think of the Web as a bunch of skyscrapers, each representing a web server, a computer always connected to the Internet, specifically designed to store information and share it. When someone starts a website, they are renting a room in this skyscraper, filling it with information and linking that information together in an organized way for others to access. The people who own these skyscrapers and rent space in them are called web hosts, but anyone can set up a web server with the right equipment and a bit of know-how.

There’s another part to having a website, without which we would be lost in the city with no way of finding what we need. This is the website address, which consists of domain names. Just like with a real-life address, a website address lets you get where you want to go.

The information stored on the websites is in web languages, such as HTML and JavaScript. When we find the website we're looking for, our web browser is able to take all the code on the site and turn it into words, graphics, and videos. We don't need to know any special computer languages because the web browser creates a graphic interface for us.

So, in a lot of ways, the World Wide Web is a big virtual city where we communicate with each other in web languages, with browsers acting as our translators. And just like no one owns a city, no one owns the Web; it belongs to all of us. Anyone can move in. We might have to pay an Internet service provider to gain access, a hosting company to rent web space, or a registrar to reserve our web address. Like utility companies in a city, these companies provide crucial services, but in the end, not even they own the Web.

What really makes the Web so special lies in its very name. Prior to the Web, we used to consume most information in a linear fashion. In a book or newspaper article, each sentence was read from beginning to end, page by page, in a straight line until you reached the end. But that isn't how our brains actually work. Each of our thoughts is linked to other thoughts, memories, and emotions in a loose interconnected network, like a web. Tim Berners-Lee, the father of the World Wide Web, understood that we needed a way to organize information that mirrored this natural arrangement. And the Web accomplishes this through hyperlinks. By linking several pages within a website or even redirecting you to other websites to expand on information or ideas immediately as you encounter them, hyperlinks allow the Web to operate along the same lines as our thought patterns.

The Web is so much a part of our lives because in content and structure, it reflects both the wider society and our individual minds. And it connects those minds across all boundaries, not only ethnicity, gender and age, but even time and space.

2.3 Mark the following statements T (True), F (False) or N (Not mentioned). Prove your choice with the corresponding lines of the text

1. The functioning of the Internet is based on protocols – sets of rules that computers follow to complete tasks.
2. The World Wide Web is just one of the many ways to communicate over the Internet.
3. Web servers never disconnect from the Internet.
4. Setting up a web server is not so difficult provided you know how to do it.
5. To access information on a web page you need to know HTML.
6. The functioning of a web browser is similar to the work of a translator.
7. The Web is owned by web hosts.
8. The way information is arranged on the Web is similar to the way a newspaper article is organized.
9. The Internet is composed of the machines, hardware and data; and the World Wide Web is what brings this technology to life.
10. The Web has become an integral part of our lives because its connectivity is almost limitless.

2.4 Find the English equivalents of the following phrases in the text

1. от проверки погоды, заказа еды и общения с друзьями до сбора средств, обмена новостями или начала революций
2. взаимозаменяемые термины
3. беспрепятственно взаимодействовать
4. при наличии подходящего оборудования и некоторой сноровки
5. преобразовать код в слова, графику и видео
6. создать графический интерфейс
7. выступать в роли переводчика
8. платить интернет-провайдеру за получение доступа
9. предоставлять жизненно важные услуги
10. воспроизводить природную конфигурацию
11. узнать более подробную информацию
12. работать на основе тех же принципов, что и наше мышление

2.5 Find words in the text whose meaning is similar to the meaning of the following words

- | | | | |
|--------------|-----------------|-----------------|-----------------|
| 1. to appear | 4. to connect | 7. essential | 10. composition |
| 2. group | 5. to transform | 8. way | 11. to meet |
| 3. to hire | 6. to produce | 9. to reproduce | 12. nationality |

2.6 Find words in the text whose meaning is opposite to the meaning of the following words

- | | | | |
|---------------|----------|------------|------------|
| 1. to prevent | 3. wrong | 5. to lose | 7. twisted |
| 2. rare | 4. real | 6. after | 8. tight |

2.7 a) Match the adjectives / nouns and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Adjective / Noun	Noun
1. direct	a) transfer
2. file	b) society
3. right	c) service
4. website	d) provider
5. graphic	e) pattern
6. service	f) network
7. utility	g) mind
8. crucial	h) line
9. linear	i) interface
10. straight	j) fashion
11. interconnected	k) equipment
12. natural	l) company
13. thought	m) call

- | | | |
|----------------|--|----------------|
| 14. wider | | n) arrangement |
| 15. individual | | o) address |

b) Match the verbs and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Verb	Noun
1. to check	a) a web address
2. to order	b) access
3. to raise	c) calls
4. to share	d) food
5. to make	e) funds
6. to access	f) information
7. to store	g) news
8. to gain	h) services
9. to rent	i) the end
10. to reserve	j) the weather
11. to provide	k) the World Wide Web
12. to reach	l) web space

2.8 Find the corresponding prepositions for the following verbs in the text. Make sentences of your own where the verbs are used in combination with the prepositions

- | | |
|---------------------------------------|---|
| 1. to chat _____ | 6. to turn / to be turned _____ |
| 2. to connect / to be connected _____ | 7. to belong _____ |
| 3. to fill / to be filled _____ | 8. to link / to be linked _____ |
| 4. to consist _____ | 9. to (re)direct / to be (re)directed _____ |
| 5. to look _____ | |

2.9 Match the terms and their meanings

Term	Meaning
1. attachment	a) uninvited, often commercial, messages transmitted through the Internet as a mass mailing to a large number of recipients
2. browser	b) to transfer (data, files, etc.) from one location (such as a large computer or the cloud) to another (such as a smaller computer, smartphone, or storage device)
3. download	c) the numeric address of a computer on the Internet
4. email	d) multimedia for playback using an offline or online media player that is delivered through a network
5. Internet	e) an electronic communications network that connects computer networks and organizational computer facilities around the world

6. IP address	f) a system for transferring messages from one computer to another, usually through a network
7. ISP (Internet Service Provider)	g) a system for accessing, manipulating, and downloading a very large set of hypertext-linked documents and other files located on computers connected through the Internet
8. router	h) a separate document or file that is included and sent with an electronic message (such as an email or text message)
9. spam	i) a group of World Wide Web pages usually containing hyperlinks to each other and made available online by an individual, company, educational institution, government, or organization
10. streaming media	j) a device that mediates the transmission routes of data packets over an electronic communications network (such as the Internet)
11. website	k) a computer program used for accessing sites or information on a network (such as the World Wide Web)
12. World Wide Web	l) a company that provides its customers with access to the Internet and that may also provide other Internet-related services (such as email accounts)

2.10 Complete the conversation between an Internet Service Provider (ISP) and a customer with words from the list below. Try to summarize the content of the conversation in 60 words or less

**attachments broadband downloading streaming media Web wireless
email messaging IP mail program Internet modem spam subscription**

ISP Helpdesk Operator (HO): Customer support, good morning.

Customer (C): Yeah, hi. Who am I speaking to?

HO: My name's Martin. How can I help?

C: I'm having some problems with my **1** _____ connection. I can't get online.

HO: OK. I'm sure I can help. Let me just quickly check your **2** _____ address ...

C: My what? What does that mean?

HO: It's just a unique series of numbers that identifies your computer when it's online. OK, just wait a sec ... Mmm ... Is your **3** _____ plugged in and working OK?

C: Is that the same as the **4** _____ router? The thing with an antenna?

HO: Yes. Are the lights flashing?

C: Yes, they're flashing really fast.

HO: OK. Just turn the router off and on at the back. Is it working now?

C: Yes, it is. Why did that happen?

HO: It's nothing serious – sometimes you just need to reset the router. Is there anything else I can help you with?

- C:** Actually, yes. I'm paying all this money for one of those fast, what do you call them, **5** _____ connections, but all I'm using the computer for is checking **6** _____ and looking up information on the **7** _____. What else can I do with all this technology?
- HO:** Well, have you tried instant **8** _____? You know, having real-time chats with friends over the Internet?
- C:** How old do you think I am? That sounds like the kind of thing my 15-year-old grandson would be into, not me!
- HO:** OK, well how fast is your connection? If it's very fast, then you can take advantage of **9** _____ – that means listening to music or podcasts, watching films or TV programs at any time you like without **10** _____ files from the Internet onto your hard drive. Some services also offer live broadcasts of concerts, theatrical performances, and sports events.
- C:** That sounds expensive. How much does it cost to watch a TV series episode?
- HO:** It depends on the site, but most of them are **11** _____ services.
- C:** OK, that all sounds interesting. Thanks for all ...
- HO:** Actually, you might be interested in a new product we've launched this week. Can I ask which **12** _____ you use?
- C:** Microsoft's Mail.
- HO:** OK, we have some new anti-**13** _____ software that helps detect junk email by looking for suspicious words in the subject line of the email. It also looks for suspicious **14** _____ – that's how viruses are normally sent between computers. It only costs £5.99 a month and ...

2.11 Translate into English

- Несмотря на то, что Интернет – относительно молодая технология, сейчас сложно представить себе жизнь без него.
- Интернет – это глобальная сеть, объединяющая сети всех видов и размеров, а система, которую мы используем для доступа в Интернет, называется Всемирной паутиной.
- Всемирная паутина функционирует на основе протокола передачи гипертекста (НТТР). Это широко используемый набор правил для передачи файлов и другой информации между компьютерами.
- Веб – это не единственная существующая система. Есть и другие способы выхода в интернет, без использования НТТР, например, электронная почта и мгновенные сообщения.
- Электронное письмо – это фрагмент текста, отправляемый получателю, часто с вложением – большими текстовыми или графическими файлами, включая аудио- и видеофайлы и цифровые фотографии.
- Обмен мгновенными сообщениями отличается от электронной почты тем, что общение происходит в режиме реального времени. При этом можно передавать файлы, разговаривать по IP и общаться в видеочате.

7. Обычно мы выходим в Интернет с помощью браузеров, таких как Microsoft Edge, Chrome и Mozilla Firefox. Они позволяют нам посещать различные веб-сайты и просматривать другой онлайн-контент.
8. Сайты социальных сетей позволяют пользователям обмениваться идеями, цифровыми фотографиями и видео, публикациями, а также публиковать информацию об онлайн-мероприятиях и событиях в реальном мире в рамках своей социальной сети.
9. С появлением широкополосного Интернета и развитием компьютерного оборудования и программного обеспечения потоковые сервисы начали набирать популярность.
10. Такие сервисы позволяют пользователям получать доступ к аудио- или видеоконтенту в прямом эфире (например, концерты, спортивные соревнования, вебинары) или по запросу (например, фильмы, подкасты, телепрограммы, лекции).

2.12 Answer the following questions

1. Do you use the Internet? If yes, how often?
2. What for do you use the Internet?
3. What websites do you visit most often?
4. Can you characterize these sites as good or bad? What are the criteria you use to evaluate the sites (e.g. design, navigation, ease of use, relevance of the content, reliability, being up-to-date)? Provide examples of both the sites you consider good and bad (the criteria used for evaluating the sites should be the same).
5. What role does the Internet play in your life? Do you think it is changing your life for the better or for the worse?

2.13 Read the essay title. Listen and compare the notes for the essay with the original text. Find the missing information, mistakes and the irrelevant material in the notes.

How has the Internet changed the personal lives of individuals all over the world?

internet and individual, personal lives

internet → changes in 1) communication 2) entertainment 3) business 4) creativity

1 communication

Email → quick, efficient communication

a) business is easier and so it is more global

b) personal relationships all over the world ...

2 information

large library of Information

a) millions of files → people can research any topic easily

b) (history, ... and ...)

3 business

i-business

a) cheap to start a business

- b) inconvenient for individual customers – shop from home*
- 4 creativity*
- small increase*
- a) personal videos, blogs and ...*
- b) negative / active changes (TV less positive)*

2.14 Listen again and fill in the table. Add your own ideas

Area of people's life	Positive effects of the Internet	Negative effects of the Internet
Communication	1 ...	1 ...
Information	1 ...	1 ...
Business	1 ...	1 ...
Creativity	1 ...	1 ...

2.15 Continue the phrase “The Internet / The Web is people's ...”. Prepare a report on the topic

MODULE II

FUNDAMENTALS OF ENGINEERING

Unit 3

ENGINEERING

Topical vocabulary

1. engineering (n)	инженерное дело
engineer (n)	инженер
2. challenge (n)	проблема, задача
3. satisfy requirements (v)	удовлетворять требованиям
complexity (n)	сложность
cost (n)	стоимость
ease of fabrication (n)	простота изготовления
performance (n)	производительность
safety (n)	безопасность
3. solution (n)	решение
desirable (adj)	желательный
efficient (adj)	эффективный
feasible (adj)	осуществимый
optimum (adj)	оптимальный
reliable (adj)	надёжный
simple (adj)	простой
4. concern oneself with (v)	заниматься (чем-либо), иметь дело с
approach (v)	подходить (к проблеме)
apply (v)	применять
boost (v)	повышать
construct (v)	сооружать
design (v)	проектировать
determine (v)	определять
employ (v)	задействовать
estimate (v)	оценивать
focus (v)	концентрироваться
implement (v)	реализовывать, воплощать
improve (v)	улучшать
increase (v)	увеличивать
lower (v)	снижать
maintain (v)	эксплуатировать, обслуживать
refine (v)	обрабатывать, очищать
utilize (v)	пользоваться

5. equipment (n)	оборудование
6. natural resources (n)	природные ресурсы
raw materials (n)	сырьё
7. source of energy (n)	источник энергии
fossil fuel (n)	ископаемое топливо
coal (n)	уголь
natural gas (n)	природный газ
petroleum (n)	нефть
falling water (n)	падающая вода
nuclear fission (n)	расщепление атомного ядра
sunlight (n)	солнечный свет
wind (n)	ветер
8. discipline (n)	дисциплина, отрасль знаний
subfield (n)	подобласть
9. civil engineering (n)	строительство
infrastructure item (n)	элемент инфраструктуры
bridge (n)	мост
dam (n)	плотина, дамба
railway (n)	железная дорога
sea defense (n)	защита от наводнений
tunnel (n)	туннель
water supply system (n)	система водоснабжения
10. mechanical engineering (n)	машиностроение
energy conversion (n)	преобразование энергии
manufacturing (n)	промышленное производство
aerospace (adj)	аэрокосмический
aircraft (n)	летательный аппарат
automotive (adj)	автомобильный
shipbuilding (n)	кораблестроение
11. electrical engineering (n)	электротехника
power plant (n)	электростанция
power source (n)	источник питания
12. chemical engineering (n)	химическая технология
chemical (n)	химикат
pharmaceutical (n)	фармпрепарат, лекарственное средство
food processing (n)	производство пищевых продуктов
13. industrial engineering (n)	организация промышленного производства
14. adhere (v)	соблюдать
comply (v)	подчиняться
rule (n)	правило
regulation (n)	предписание, регламент
schedule (n)	расписание

15. load (n)	нагрузка
fatigue test (n)	испытание на усталостное разрушение
stress test (n)	испытание под нагрузкой
16. artificial intelligence (AI) (n)	искусственный интеллект (ИИ)
connectivity (n)	обеспечение связи
cybersecurity (n)	кибербезопасность

3.1 Read the quote and try to explain the engineer’s view of the glass-half-full / glass-half-empty problem

“A pessimist says the glass is half empty, an optimist says the glass is half full, and an engineer says the glass is too big.” (*Scott Edward Skjefte*)

3.2. Read the text and fill in the table

What I knew before reading the text	What I learned from the text	What made me look at what I knew from a different angle
1. ...	1. ...	1. ...

WHAT IS ENGINEERING?

Engineering is the art of the possible. It’s applying skill and creative thinking to solving the world’s biggest challenges. From climate change to connectivity, clean water to cybersecurity, engineering touches every aspect of our lives. Engineers are the catalyst behind what’s called the “built environment”: the homes we live in, the buildings we work in, and the roads, bridges, rail networks, and airports that get us there. Engineers design how our world works and how we can bring it closer together.

Engineers approach every project with the mindset of, “How can I make this better... more efficient... safer... greener?” Engineering solutions must satisfy conflicting requirements. Usually, efficiency costs money, safety adds to complexity, and improved performance increases weight. The engineering solution is the optimum solution, the end result that, taking many factors into account, is most desirable. It may be the most reliable within a given weight limit, the simplest that will satisfy certain safety requirements, or the most efficient for a given cost. In many engineering problems the social and environmental costs are significant.

Engineers employ two types of natural resources – materials and energy. Materials are useful because of their properties: their strength, ease of fabrication, lightness, or durability; their ability to insulate or conduct; their chemical, electrical, or acoustic properties. Important sources of energy include fossil fuels (coal, petroleum, natural gas), wind, sunlight, falling water, and nuclear fission. Since most resources are limited, engineers must concern themselves with the continual development of new resources as well as the efficient utilization of existing ones.

Engineering is a field composed of relentless problem solvers – and there are a host of disciplines and subfields from which to choose. Whether you are fascinated by the wonders of

AI and drone technology or you want to leverage your organizational skills into a project manager role, there is something within the engineering field for everyone. Here are just a few:

Civil engineering involves designing, building, and also maintaining structures such as infrastructure items. The term *infrastructure* refers to for example, railways, hospitals, water supply systems, bridges, tunnels, buildings, dams, sea defenses, and other systems and structures that we tend to take for granted.

Mechanical engineers work in the design, creation, and implementation of mechanical systems. Much of their work involves studying objects in motion.

They are key employees in a number of different industries including manufacturing, energy conversion, automotive, aerospace, shipbuilding, construction, medical devices, railways, and power.

Electrical engineers focus on technology that uses electricity as its power source. They work on electrical devices, systems, and components. While one person might be working on something tiny, such as a microchip, another could be building a giant power plant.

Chemical engineers are involved in creating industrial chemicals, pharmaceuticals, as well as food processing. They design and implement the systems, processes, and equipment for refining raw materials and processing chemicals to make products that consumers, businesses, and other entities use.

Industrial engineers, as the name suggests, work in industry. More specifically, they focus on boosting efficiency, lowering costs, improving product quality (or service quality), and health and safety in the workplace.

They also implement strategies to make a company or its factory environmentally friendly. *Compliance* is also the focus of industrial engineers. *Compliance* refers to adhering to or complying with (obeying) specific rules and regulations.

3.3 Answer the following questions

1. Why is engineering referred to as ‘the art of the possible’?
2. What aspects of people’s lives does engineering touch? Name at least five.
3. What are the characteristics of the engineering solution?
4. What kind of resources do engineers employ? What affects their choice?
5. What products of engineering can you see around yourself right now? Name at least five.
What engineering fields are concerned with them?
6. What engineering professionals are qualified to work in nearly any industry? Why?

3.4 Find the English equivalents of the following phrases in the text

1. применение навыков и творческого мышления для решения самых сложных задач в мире
2. затрагивать все аспекты нашей жизни
3. увеличивать сложность
4. повышенная производительность
5. учитывая многие факторы
6. наиболее надежный при заданном предельном весе

7. соблюдать определенные требования безопасности
8. использовать два вида природных ресурсов
9. увлекаться чудесами искусственного интеллекта и беспилотных технологий
10. системы водоснабжения
11. воспринимать как само собой разумеющееся
12. включать в себя изучение движущихся объектов
13. переработка сырья
14. как следует из названия
15. соблюдение определенных правил и предписаний

3.5 Find words in the text whose meaning is similar to the meaning of the following words

- | | | | |
|-------------------|-------------------|---------------|--------------------|
| 1. problem | 4. to utilize | 7. to include | 10. transformation |
| 2. need | 5. characteristic | 8. object | 11. to concentrate |
| 3. productiveness | 6. area | 9. producing | 12. to fulfill |

3.6 Find words in the text whose meaning is opposite to the meaning of the following words

- | | | | | |
|------------|---------------|-----------|-----------|-----------------|
| 1. similar | 3. simplicity | 5. fusion | 7. beyond | 9. to reduce |
| 2. danger | 4. to conduct | 6. bored | 8. giant | 10. to increase |

3.7 a) Match the adjectives / nouns and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Adjective / Noun	Noun
1. creative	a) change
2. climate	b) conversion
3. conflicting	c) devices
4. optimum	d) fission
5. natural	e) fuels
6. chemical	f) manager
7. fossil	g) materials
8. nuclear	h) plant
9. efficient	i) processing
10. project	j) properties
11. energy	k) requirements
12. electrical	l) resources
13. power	m) solution
14. food	n) thinking
15. raw	o) utilization

b) Match the verbs and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Verb	Noun
1. to apply	a) weight
2. to solve	b) strategies
3. to satisfy	c) skill
4. to cost	d) rules
5. to increase	e) resources
6. to employ	f) requirements
7. to process	g) quality
8. to boost	h) money
9. to lower	i) efficiency
10. to improve	j) costs
11. to implement	k) chemicals
12. to obey	l) challenges

3.8 Find the corresponding prepositions for the following verbs in the text. Make sentences of your own where the verbs are used in combination with the prepositions

1. to add _____
2. to concern oneself / to be concerned _____
3. to choose _____
4. to fascinate / to be fascinated _____
5. to work _____
6. to involve someone / to be involved _____
7. to focus _____
8. to adhere _____
9. to comply _____

3.9 Match the words / phrases and their meanings

Word / phrase	Meaning
1. to apply	a) a useful or valuable possession or quality of a country, organization, or person
2. to be in charge	b) to prepare, change, or treat food or natural substances as a part of an industrial operation
3. to be concerned with	c) to make use of something for a particular purpose
4. to design	d) a list of planned activities or things to be done showing the times or dates when they are intended to happen or be done
5. to estimate	e) to keep in good condition and working order

6. feasible	f) to guess or calculate the cost, size, value, etc. of something
7. to maintain	g) to deal with
8. to process	h) to create or construct according to plan
9. resource	i) to have control of or be responsible for someone or something
10. schedule	j) able to be done in practice

3.10 Complete the conversation between a radio program host and the program's guest with words from the list below. Try to summarize the content of the conversation in 50 words or less

challenge cost designing engineer feasibility ideas improve loads mechanical practical schedule solutions stress training work

Host (H): For our next guest, I'd like to welcome to the program Lindsey Barone, head of engineering at Swift Aerospace.

Guest (G): Good morning, everyone.

H: Lindsey, you're an **1** _____, but why did you become one? What got you interested?

G: Well, from a young age I was always interested in how things **2** _____. I chose engineering as a career because I wanted to make things better. Engineering isn't just about testing theories and building models. It's about **3** _____ new products and finding new uses for old products. I want to **4** _____ the way the world works.

H: Mmm, interesting. And could you tell me a bit about your **5** _____?

G: Well, I studied engineering at university. I was in the **6** _____ engineering department

H: You're head of engineering now. How did you get to where you are today?

G: Well, I started in a test lab for airplanes. I did **7** _____ and fatigue tests there. Basically, I broke things! Doing that sort of research is very important as it tells you what **8** _____ the structures can carry. Then I went into airplane design. I worked on all areas of commercial planes before moving into project management in the aircraft industry.

H: Could you tell me a bit more about what you do now?

G: Sure. These days I mainly work in project management. I take **9** _____ for projects and investigate their **10** _____ – that means I see if the projects are possible. Next, I develop the objectives and estimate the **11** _____ of the project. Then I help the people working on the project to meet their deadlines. I have to make sure projects come in on budget and on **12** _____.

H: Now you're head of department and I guess in charge of a lot of people. How do you find that?

G: Well, it wasn't too easy at first. I had to prove myself. When they could see that I had good **13** _____ experience and ability, everything was fine.

H: I suppose that's true of anyone who's in charge. OK, Lindsey, finally – what's the best thing about being an engineer?

G: That's an easy one to answer. I love the **14** _____ of finding **15** _____ to problems. I hope that what I do improves people's lives. For me, engineering is fun, exciting and satisfying.

H: Thanks very much, Lindsey. Now, our next guest is someone who ...

3.11 Translate into English

1. Инженерное дело – это применение естественных наук и математики, чтобы сделать свойства вещества и источники энергии в природе полезными для людей.
2. Существует множество инженерных дисциплин, каждая из которых имеет свои собственные области и специальности.
3. Инженеры-механики занимаются проектированием и производством изделий и машин.
4. Как и во всех прочих областях инженерного дела, в машиностроении требуется умение решать задачи, что помогает разрабатывать и проектировать некоторые из наиболее важных механизмов, которыми мы все пользуемся.
5. Инженеры-электрики работают над электрическими компонентами, устройствами и системами.
6. Проекты в области электротехники могут включать крошечные детали, такие как микрочипы, или гигантские генераторы для электростанций.
7. Промышленные инженеры используют сочетание научных, математических и инженерных методов для проектирования оборудования, зданий, информационных систем и многого другого.
8. Эти инженеры также помогают управлять бизнесом, определяя, сколько работников необходимо для проекта, сколько времени потребуется для его завершения и какой процесс будет задействован в проекте.
9. Если вы увлекаетесь физикой и микробиологией, химическая технология – это то, что вам нужно.
10. Инженеры-химики используют сочетание инженерных и научных знаний для обработки пищевых продуктов, производства промышленных химикатов и создания фармацевтических препаратов.
11. Строительство – один из старейших видов инженерной деятельности в мире.
12. Инженеры-строители занимаются развитием городской и сельской инфраструктуры от использования водных ресурсов до строительства метро.

3.12 Answer the following questions

1. What engineering discipline are you being trained in?
2. What are the professionals in this discipline concerned with?
3. What kind of knowledge and skills do they need?
4. Where and how are they trained?
5. What personal qualities should they have?
6. Where do they work?
7. Are they in demand on the job market?
8. What are their career prospects?

3.13 Conservation scientists working on projects in remote regions of the Amazon jungle need volunteers – biologists, chemists, meteorologists, and logisticians who are ready to work in primitive conditions – to join them in environmental projects and scientific research. Listen to the interview with one of the candidates and decide whether the following statements are true (T) or false (F). Correct the wrong statements

1. The candidate has nine years of work experience.
2. Her present job involves a lot of planning.
3. The candidate has already taken parts in conservation projects.
4. She learned to speak Portuguese while working on one of her previous projects.
5. The candidate worked with a TV crew in the Sahara for four years.
6. She has experience of repairing many different types of machinery.
7. The candidate doesn't mind living in primitive conditions.
8. She is passionate about saving the rainforests and took part in making the documentary *An Inconvenient Truth*.

3.14 Listen again and make a list of the candidate's strengths and weaknesses. Do you think she will get the job?

3.15 Tell about a field of engineering different from the one you are being trained in. Use the questions in Task 3.12 as a plan for your report.

Unit 4

ENGINEERING MATERIALS

Topical vocabulary

1. engineering material (n)	конструкционный материал
2. metal (n)	металл
ferrous (adj)	чёрный (металл)
iron (n)	железо
cast iron (n)	чугун
wrought iron (n)	кованое железо
steel (n)	сталь
non-ferrous (adj)	цветной (металл)
aluminum (n)	алюминий
copper (n)	медь
nickel (n)	никель
titanium (n)	титан
zinc (n)	цинк
alloy (n)	сплав
brass (n)	латунь
bronze (n)	бронза
3. polymer (n)	полимер
nylon (n)	нейлон
polyurethane (n)	полиуретан
4. ceramic (adj)	керамический
5. composite (adj)	композитный (материал)
concrete (n)	бетон
fiber-glass (n)	стекловолокно
plywood (n)	фанера
6. substance (n)	вещество
carbon (n)	углерод
silicon (n)	кремний
paper (n)	бумага
stone (n)	камень
wood (n)	дерево
7. contain (v)	содержать
content (n)	содержание (количество)
8. ratio (n)	соотношение
9. property (n)	свойство
ductile (adj)	ковкий, тягучий
durable (adj)	долговечный
flexible (adj)	гибкий
hard (adj)	твёрдый

inert (adj)	инертный
light (adj)	легкий
magnet (n)	магнит
malleable (adj)	ковкий, податливый
melting point (n)	температура плавления
soft (adj)	мягкий
strong (adj)	прочный
tough (adj)	крепкий, прочный
weak (adj)	слабый
weight (n)	вес
10. conductive (adj)	проводящий
electrical conductivity (n)	электропроводность
thermal conductivity (n)	теплопроводность
semiconductor (n)	полупроводник
insulator (n)	изолятор
11. resistance (n)	устойчивость
corrosion (n)	коррозия
rust (n)	ржавчина
wear (n)	износ
12. prevent (v)	предотвратить, не допускать
protect (v)	защищать
coat (v)	наносить покрытие
galvanization (n)	оцинковывание
13. alter (v)	вносить изменения
combine (v)	сочетать, комбинировать
enhance (v)	повышать, усиливать
provide (v)	обеспечивать
14. advantage (n)	преимущество
strength (n)	сильная сторона
available (adj)	доступный, имеющийся в наличии
diverse (adj)	разнообразный
excellent (adj)	отличный
valuable (adj)	ценный
versatile (adj)	многоцелевой, универсальный
limitation (n)	ограничение
15. mold (v)	формовать
shape (n)	фигура, форма
16. smart (adj)	умный
intelligent (adj)	интеллектуальный
sense (v)	воспринимать, чувствовать
respond (v)	откликаться, реагировать
self-healing (adj)	самовосстанавливающийся

4.1 How would you characterize a person who has *a heart of gold? nerves of steel? the brass neck?* Why?

4.2 Read the text and fill in the table

What I knew before reading the text	What I learned from the text	What made me look at what I knew from a different angle
1. ...	1. ...	1. ...

ENGINEERING MATERIALS AND THEIR PROPERTIES

Engineering materials are the building blocks of modern society and a critical component of countless products, structures, and machines. From metals and ceramics to polymers and composites, the range of materials available to engineers is vast and constantly evolving. Understanding the properties, strengths, and limitations of each type of material is key to designing and constructing effective and efficient engineering solutions.

Basically, there are mainly three types of engineering materials: metals, polymers, and ceramics

Metals are very common engineering materials. Generally there are three types of metals: ferrous metals, non-ferrous metals, and alloys.

Mainly composed of iron and carbon, ferrous metals are widely used in various industries due to their desirable mechanical properties, availability, and relatively low cost. However, they are prone to rust and corrosion, necessitating protective measures such as coatings, galvanization, or alloying to enhance their resistance to environmental degradation. Common examples of ferrous metals include pure iron (Fe) (a soft and ductile metal), steel (an alloy of iron and carbon), cast iron (an alloy of iron, carbon, and silicon), and wrought iron (a very low-carbon alloy of iron).

Non-ferrous metals are metals that do not contain iron or have very low iron content. These metals are known for their light weight, corrosion resistance, electrical conductivity, and malleability. They find applications in a wide range of industries, including electronics, aerospace, construction, automotive, and more. Some examples of non-ferrous metals include aluminum (Al) (a lightweight metal with excellent corrosion resistance), copper (Cu) (a highly conductive metal with excellent electrical and thermal properties), brass (an alloy of copper and zinc), bronze (an alloy of copper and other elements), nickel (Ni) (a versatile metal with excellent corrosion resistance and high-temperature strength), titanium (Ti) (a lightweight metal with a high strength-to-weight ratio and excellent corrosion resistance), zinc (Zn) that is commonly used as a protective coating for steel to prevent corrosion.

Alloys are metallic substances that are composed of two or more elements, with at least one of them being a metal. These are created by combining metals or metals and non-metallic elements to enhance their properties or provide new characteristics that are not present in the individual elements. Alloying can alter properties such as strength, hardness, corrosion resistance, electrical conductivity, and melting point. These materials are used in different

manufacturing processes such as gear manufacturing, automotive, aerospace applications, and all other manufacturing tasks.

Polymer materials are versatile engineering materials widely used in various industries. They offer flexibility, light weight, corrosion resistance, and electrical insulation. Polymers can be molded into complex shapes, making them suitable for intricate components. However, they may have lower strength compared to metals and temperature limitations. Nevertheless, their advantages make them valuable in applications such as automotive, aerospace, electronics, and packaging. With ongoing advancements, engineers continue to explore and optimize polymer materials to meet evolving design requirements and drive innovation in diverse sectors.

Ceramics are inorganic, nonmetallic materials valued for such useful properties as high strength and hardness, high melting temperatures, chemical inertness, and low thermal and electrical conductivity. In electronic applications they are used as insulators, semiconductors, conductors, and magnets. They also have important uses in the aerospace, biomedical, construction, and nuclear industries.

4.3 Mark the following statements T (True), F (False) or N (Not mentioned). Prove your choice with the corresponding lines of the text

1. New engineering materials appear practically every day.
2. The limitations of ferrous metals can't be overcome.
3. Non-ferrous metals never contain iron.
4. Nickel has found a wide range of applications.
5. Non-ferrous metals and alloys are used in medicine due to their corrosion resistance.
6. Alloys are composed exclusively of metals.
7. Polymers do not conduct electricity.
8. Some polymers can be machined like metals.
9. Metals can withstand a wider range of temperatures than polymers.
10. Ceramics include both organic and inorganic materials.

4.4 Find the English equivalents of the following phrases in the text

1. важнейший компонент бесчисленного множества продуктов
2. ассортимент материалов, доступных инженерам
3. состоит в основном из железа и углерода
4. желательные механические свойства
5. подвержен ржавчине и коррозии
6. повышать устойчивость к негативному воздействию окружающей среды
7. находить применение в самых разных отраслях промышленности
8. металл с высокой проводимостью
9. высокая удельная прочность
10. обеспечивать новые характеристики, которых нет у отдельных элементов
11. универсальные конструкционные материалы, широко используемые в различных отраслях промышленности

12. придавать сложную форму
13. обладать меньшей прочностью по сравнению с металлами
14. стимулировать инновации в различных отраслях
15. низкая тепло- и электропроводность

4.5 Find words in the text whose meaning is similar to the meaning of the following words

- | | | | | |
|--------------|-----------------|---------------|--------------|-----------------|
| 1. selection | 3. to intensify | 5. proportion | 7. to offer | 9. to shape |
| 2. diverse | 4. universal | 6. to avoid | 8. to modify | 10. to research |

4.6 Find words in the text whose meaning is opposite to the meaning of the following words

- | | | | |
|--------------|------------|----------|---------------|
| 1. weakness | 3. alloyed | 5. heavy | 7. wrong |
| 2. evolution | 4. hard | 6. poor | 8. reactivity |

4.7 a) Match the adjectives / nouns and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Adjective / Noun	Noun
1. building	a) advancements
2. ferrous	b) blocks
3. desirable	c) conductivity
4. environmental	d) coating
5. corrosion	e) degradation
6. protective	f) insulation
7. melting	g) inertness
8. versatile	h) metals
9. electrical	i) materials
10. complex	j) properties
11. ongoing	k) point
12. high	l) resistance
13. diverse	m) strength
14. chemical	n) shapes
15. thermal	o) sectors

b) Match the verbs and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Verb	Noun
1. to enhance	a) applications
2. to drive	b) corrosion
3. to find	c) innovation
4. to prevent	d) properties

- | | |
|-------------|-----------------|
| 5. to alter | e) requirements |
| 6. to meet | f) resistance |

4.8 Find the corresponding prepositions for the following verbs and phrases in the text. Make sentences of your own where the verbs and phrases are used in combination with the prepositions

- | | |
|-------------------------|-------------------------|
| 1. to be key _____ | 5. to be created _____ |
| 2. to be composed _____ | 6. to be molded _____ |
| 3. to be prone _____ | 7. to be suitable _____ |
| 4. to be known _____ | |

4.9 Match the properties of engineering materials and their descriptions

Property	Description
1. chemical inertness	a) temperature at which a solid material transforms into a liquid state
2. corrosion resistance	b) resistance of a material to scratching, cutting, indentation or abrasion
3. ductility	c) resistance of a material to breaking under repeated twisting and bending forces
4. flexibility	d) quality of being unreactive with other chemical compounds or elements
5. hardness	e) capability of being shaped or extended by hammering, forging, pressing between rollers, etc.
6. malleability	f) ability of a material to withstand erosion or degradation due to contact with other surfaces
7. melting point	g) ability of a material to withstand an applied force without breaking or deforming
8. strength	h) ability of a material to withstand chemical reactions with its surroundings
9. toughness	i) ability of a material to have its shape changed (as by being drawn out into wire or thread) without losing strength or breaking
10. wear resistance	j) ability of a material to bend or be bent repeatedly without breaking

4.10 Complete the conversation about sports equipment with words from the list below.

Try to summarize the content of the conversation in 45 words or less

SKATEBOARD

hard hardness light polyurethane strength strong

A OK, so tell me about the skateboard.

B Right. The body part is the deck.

A What's it made of?

B Plywood. This means it's **1** _____ and **2** _____.

A OK. What's the difference between the front and back?

B The front is called the nose. And the back is the tail.

A Nose and tail. Right.

B There's an angle of twenty degrees.

A What for?

B It helps the skateboarder perform tricks.

A Cool. So, what about under the board?

B These things are the trucks.

A What are they made of? Metal?

B Yes – sometimes it's titanium for **3** _____. The top is called the baseplate. The bottom is the hanger.

A Got it. And the wheels – they're plastic, right?

B Right. They're made of **4** _____. The **5** _____ varies. Very **6** _____ wheels are good for performance. Is that it?

A What about these? Are they springs, like a car suspension?

B Oh yes, they're called bushings. They help you to turn the board. ...

SNOWBOARD

fiber-glass flexible light nylon steel strength tough wear-resistant wood

B ... I think I know a bit about the snowboard. Is it made of **7** _____?

A Yeah, partly. But **8** _____ is used for the core.

B Really? How come?

A It gives the board **9** _____ but keeps it **10** _____. And it makes it **11** _____.

B OK. Is it the same on both sides?

A The base, the bottom, is covered with a kind of **12** _____ plastic.

B What's it called?

A *P-tex*. It helps the board slide but it's **13** _____.

B Right. Important on snow. What about the edge? Is it made of *p-tex* as well?

A No, that's **14** _____. It helps the board grip the snow.

B When it turns and does tricks?

A Yeah, I suppose so.

B OK. Oh, and these straps – are they made of **15** _____?

A Yeah. They're called bindings. That's it.

4.11 Translate into English

1. Передовые инженерные материалы играют решающую роль в современных технологиях и инновациях.
2. Эти материалы специально оптимизированы для обеспечения определенных эксплуатационных характеристик, таких как повышенная прочность, гибкость и устойчивость к коррозии.
3. Передовые инженерные материалы доступны в различных формах, включая металлы, керамику, полимеры и композиты.
4. Эти материалы могут быть сложным образом структурированы на атомном и молекулярном уровнях для получения уникальных и очень востребованных свойств.
5. Одним из самых привлекательных аспектов передовых инженерных материалов является возможность создавать более компактные, легкие и эффективные изделия с улучшенными эксплуатационными характеристиками и повышенной долговечностью.
6. Композитные материалы – пример передовых инженерных материалов, обладающих улучшенными свойствами по сравнению с традиционными материалами.
7. Такие материалы изготавливаются из двух или более составляющих с существенно отличающимися физическими или химическими свойствами. В результате получается материал с характеристиками, отличными от характеристик отдельных компонентов.
8. Интеллектуальные материалы, также известные как «умные» или «адаптивные» материалы, являются еще одной областью, где ведутся важные разработки.
9. Эти материалы могут реагировать на изменения в окружающей среде, такие как изменение температуры, уровня освещенности или механическое напряжение, претерпевая обратимые изменения в своих свойствах.
10. «Умные» материалы используются повсеместно — от самовосстанавливающихся материалов в аэрокосмической отрасли до сплавов с памятью формы в биомедицинских устройствах.

4.12 Think of the engineering discipline you are being trained in and select a material used in the area. Answer the following questions

1. When and by whom the material was first discovered / obtained (if it is known)?
2. What is the composition of the material (if it is not a single chemical element)?
3. What are the properties of the material?
4. How is the material used in the given area?
5. What are the advantages and disadvantages of using the material in the area described?
6. What are the prospects of using the material in this area?

4.13 Answer the following questions

1. What materials are usually used for building bridges?
2. What properties are important for such materials?

Listen to the text ‘Experimental Bridge’ and complete your answers if there is any new information in the text. Answer the following questions

3. Why is the bridge experimental?
4. What are the advantages and disadvantages of this experimental bridge?
5. Do you think such bridges could find real-life applications?

4.14 Listen again. What do the following numbers refer to?

- | | | | |
|----------|----------|--------------|--------------|
| 1. 32 ft | 3. 10 ft | 5. 2 months | 7. 72,000 lb |
| 2. 80 ft | 4. 4 ft | 6. 12,000 lb | 8. 9,000 lb |

4.15 Design a project where a widespread material is used unusually. Describe the advantages and disadvantages of using this material for the purpose and analyze the feasibility of such a project as a whole

Unit 5

NANOTECHNOLOGY

Topical vocabulary

1. measure (v)	измерять; иметь размер
unit of measure (n)	единица измерения
scale (n)	масштаб
huge (adj)	огромный
tiny (adj)	крошечный
2. reduce (v)	уменьшать, сокращать
3. dimension (n)	измерение, размерность
two-dimensional (adj)	двумерный
4. visible light (n)	видимый свет
light microscope (n)	световой микроскоп
wavelength (n)	длина волны
5. bulk material (n)	макроматериал, объёмный материал
6. chemical composition (n)	химический состав
7. surface (n)	поверхность
surface area (n)	площадь поверхности
volume (n)	объём
8. cluster (n)	скопление, кластер
film (n)	плёнка
particle (n)	частица
wire (n)	провод
9. behave (v)	вести себя
phenomenon (n)	явление
10. classical physics (n)	классическая физика
common sense (n)	здравый смысл
11. quantum mechanics (n)	квантовая механика
contradict (v)	противоречить
electron tunneling (n)	туннелирование электронов
erratically (adv)	хаотично
penetrate (v)	проникать
teleport (v)	телепортироваться
12. electric charge (n)	электрический заряд
capacity (n)	ёмкость
13. antimicrobial (adj)	противомикробный
biocompatible (adj)	биосовместимый
transparent (adj)	прозрачный
14. cell (n)	клетка
15. reproduce (v)	воспроизводить
self-replicating (adj)	самовоспроизводящийся

5.1 Read the quote and explain how you understand it in terms of technology

“There’s plenty of room at the bottom.” (Richard Feynman)

5.2 Read the text and fill in the table

What I knew before reading the text	What I learned from the text	What made me look at what I knew from a different angle
1. ...	1. ...	1. ...

THE WORLD OF NANOTECHNOLOGY

There’s an unprecedented multidisciplinary convergence of scientists dedicated to the study of a world so small, we can’t see it – even with a light microscope. That world is the field of nanotechnology, the realm of atoms and nanostructures. Nanotechnology is so new, no one is really sure what will come of it. Even so, predictions range from the ability to reproduce things like diamonds and food to the world being devoured by self-replicating nanorobots.

In order to understand the unusual world of nanotechnology, we need to get an idea of the units of measure involved. A centimeter is one-hundredth of a meter, a millimeter is one-thousandth of a meter, and a micrometer is one-millionth of a meter, but all of these are still huge compared to the nanoscale. A nanometer (nm) is one-billionth of a meter, smaller than the wavelength of visible light and a hundred-thousandth the width of a human hair.

Experts sometimes disagree about what constitutes the nanoscale, but in general, you can think of nanotechnology dealing with anything measuring between 1 and 100 nm. Larger than that is the microscale, and smaller than that is the atomic scale.

One of the exciting and challenging aspects of the nanoscale is the role that quantum mechanics plays in it. The rules of quantum mechanics are very different from classical physics, which means that the behavior of substances at the nanoscale can sometimes contradict common sense by behaving erratically. You can’t walk up to a wall and immediately teleport to the other side of it, but at the nanoscale an electron can – it’s called electron tunneling. Substances that are insulators, meaning they can’t carry an electric charge, in bulk form might become semiconductors when reduced to the nanoscale. Melting points can change due to an increase in surface area. Much of nanoscience requires that you forget what you know and start learning all over again.

So what does this all mean? Right now, it means that scientists are experimenting with substances at the nanoscale to learn about their properties and how we might be able to take advantage of them in various applications. Engineers are trying to use nano-size wires to create smaller, more powerful microprocessors. Doctors are searching for ways to use nanoparticles in medical applications. Still, we’ve got a long way to go before nanotechnology dominates the technology and medical markets.

5.3 Answer the following questions

1. Why can't nanoscale objects be seen with a light microscope?
2. How big / small is nanoscale? Put the following things in order of their size from the smallest to the biggest: *an atom, a human hair, a nanometer, wavelength of visible light*.
3. Why can insulators in bulk form become semiconductors at the nanoscale?
4. Why do melting points change at the nanoscale?
5. What are current applications of nanotechnology? Give examples both from the text and your own.
6. What predictions are made about the future of nanotechnology? Which of them seem more accurate to you?

5.4 Find the English equivalents of the following phrases in the text

1. беспрецедентное объединение усилий ученых, представляющих разные области знаний
2. мир атомов и наноструктур
3. способность воспроизводить, к примеру, алмазы и продукты питания
4. быть поглощенным самовоспроизводящимися нанороботами
5. получить представление о применяемых единицах измерения
6. меньше длины волны видимого света
7. стотысячная часть толщины человеческого волоса
8. вести себя неустойчиво
9. переносить электрический заряд
10. увеличить площадь поверхности
11. искать способы применения наночастиц в медицине
12. впереди долгий путь

5.5 Find words in the text whose meaning is similar to the meaning of the following words

- | | | |
|------------------|-----------------|-----------------|
| 1. extraordinary | 6. to reproduce | 11. material |
| 2. consolidation | 7. to make | 12. to oppose |
| 3. focused | 8. size | 13. to act |
| 4. area | 9. side | 14. to transfer |
| 5. to destroy | 10. traditional | 15. to look |

5.6 Find words in the text whose meaning is opposite to the meaning of the following words

- | | | | |
|-----------|------------|-------------------|----------------|
| 1. tiny | 3. easy | 5. systematically | 7. to enlarge |
| 2. boring | 4. similar | 6. later | 8. to remember |

5.7 a) Match the adjectives / nouns and the nouns to form all possible word combinations.**Make sentences of your own with the word combinations**

Adjective / Noun	Noun
1. multidisciplinary	a) area
2. self-replicating	b) charge
3. visible	c) convergence
4. human	d) form
5. atomic	e) hair
6. quantum	f) light
7. classical	g) mechanics
8. common	h) nanorobots
9. electron	i) physics
10. electric	j) scale
11. bulk	k) sense
12. surface	l) tunneling

b) Match the verbs and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Verb	Noun
1. to reproduce	a) advantage
2. to devour	b) common sense
3. to contradict	c) an electric charge
4. to carry	d) diamonds
5. to take	e) markets
6. to dominate	f) the world

5.8 Find the corresponding prepositions for the following verbs and phrases in the text.**Make sentences of your own where the verbs and phrases are used in combination with the prepositions**

- | | |
|-----------------------------|----------------------------|
| 1. to be dedicated _____ | 6. to be reduced _____ |
| 2. to come _____ | 7. to experiment _____ |
| 3. to range _____ ... _____ | 8. to take advantage _____ |
| 4. to disagree _____ | 9. to search _____ |
| 5. to deal _____ | |

5.9 Match the words and their definitions

Word	Definition
1. biocompatible	a) allowing light to pass through so that objects on the other side can be clearly seen

2. bulk	b) the smallest basic unit of a living organism
3. capacity	c) to be a particular size
4. cell	d) to travel, often instantaneously, from one point to another without physically crossing the distance between the two points
5. cluster	e) having no harmful effect on living organisms
6. film	f) a small group of similar things that are closely packed together
7. to measure	g) large in size, mass or volume
8. particle	h) a thin layer of something on a surface
9. teleport	i) an extremely small piece of something
10. transparent	j) a measure of the electric output of a battery or generator

5.10 Complete the text with words from the list below. Try to summarize the content of the text in 35 words or less

capacity cell clothes conductive electronics faster glucose ordinary (x2)
possibilities (x2) sports stronger (x2) tiny thinner touchscreen (x2)
transparent vaccines

Nanotechnology is this new field of science and engineering that you're going to see everywhere. You may not realize it, but nanotechnology is already changing the game. It's given us **1** _____ computers and **2** _____ building materials, not to mention every **3** _____ you've ever used.

The key is the discovery of new, **4** _____ materials. Take a look at the objects around you, the **5** _____ you love, the **6** _____ equipment you use, the **7** _____ you wear.

Think about the materials they're made of. It might seem incredible, but we can make something revolutionary from something that seems **8** _____.

When regular materials are made very small, they can become **9** _____, brighter, even biocompatible. For example, when it comes to **10** _____ technology, we take a regular piece of glass and coat it with a **11** _____ film that's hundreds of times **12** _____ than the foil in your kitchen.

That kind of technology can even turn **13** _____ windows into **14** _____ solar panels.

When you combine this new technology with the unlimited creativity of humanity, the **15** _____ are endless. We're going to see ultra-**16** _____ batteries that can power trucks, trains, and even airplanes; drinking water that can be harvested from the humidity in the air; **17** _____ levels that can be monitored continuously and painlessly. Plus, all sorts of **18** _____ and gene therapies that can be delivered directly inside the **19** _____.

Nanotechnology is opening up a whole new universe of **20** _____ where our imagination is the limit.

5.11 Translate into English

1. Свойства элементов, с которыми мы знакомы по нашему повседневному опыту, могут не проявляться на наноуровне.

2. Например, уменьшая объем золота до размера наночастиц, вы снижаете его температуру плавления, потому что, когда вы уменьшаете любую частицу до наноразмеров, отношение поверхности к объему значительно увеличивается.
3. Кроме того, на наноуровне золото ведет себя как полупроводник, а в обычном состоянии оно проводит электричество.
4. В своём обычном состоянии алюминий не обладает магнитными свойствами, но очень маленькие скопления атомов алюминия могут их проявлять.
5. Некоторые элементы, например кремний, практически не меняются на наноуровне, что делает их идеальными для транзисторов и других применений.
6. При работе с объектами, размеры которых сопоставимы с размерами наночастиц или меньше, мы сталкиваемся с областью квантовой механики, которая часто противоречит законам классической физики.
7. Обычно электрон не может пройти через изолятор, но если изолятор достаточно тонкий, то электрон может переместиться с одной стороны изолятора на другую.
8. Это явление называется туннелированием электронов, однако название на самом деле не дает вам представления о том, насколько необычным может быть этот процесс.
9. Электрон перемещается с одной стороны изолятора на другую, фактически не проникая в сам изолятор и не занимая пространство внутри него.
10. Можно сказать, что он телепортируется с одной стороны на другую.

5.12 Think of the engineering discipline you are being trained in and answer the following questions

1. Is nanotechnology already part of the area? If yes, how is it used?
2. If nanotechnology is not used in the area now, does it have any prospects in it? What are they?
3. What are the possible benefits and threats of using nanotechnology in the area?
4. What might the distant future of the area be like if nanotechnology and its methods keep developing?

5.13 Listen to information about nanotechnology and decide whether the following statements are true (T) or false (F). Correct the wrong statements

1. The chemical composition of nanomaterials is radically different from the chemical composition of bulk materials.
2. Nanoparticles are composed of 100 atoms or less.
3. The behavior of nanomaterials is determined by their shape and size.
4. All nanomaterials sink in solutions because of their small size.
5. Nanomaterials may differ in color from their bulk counterparts.
6. Scientists can manipulate nanomaterials so that they meet specific requirements.
7. Bulk silver has antimicrobial properties.
8. Some nanostructures made of silver are transparent.

5.14 Listen again and fill in the table. Add your own ideas

Nanomaterial	Properties	Uses
1. ...	1. ...	1. ...

5.15 Tell about a nanoobject. While preparing your report answer the following questions

1. What is the structure of the object?
2. How can such an object be obtained?
3. What are the properties of the object?
4. How may such an object be used?
5. What are the advantages and disadvantages of the object?
6. What are the future prospects of the object?

Unit 6

ROBOTICS

Topical vocabulary

1. robot (n)	робот
robotic arm (n)	робот-манипулятор
drone (n)	беспилотный летательный аппарат
exoskeleton (n)	экзоскелет
humanoid (adj)	человекоподобный
prosthetic limb (n)	протез конечности
rover (n)	планетоход
submarine (n)	подводная лодка
2. task (n)	задача
boring (adj)	скучный
dangerous (adj)	опасный
monotonous (adj)	монотонный
repetitive (adj)	повторяющийся
3. carry out (v)	выполнять
accomplish (v)	осуществлять, совершать
handle (v)	обращаться, работать (с чем-либо)
perform (v)	исполнять, делать
4. actuator (n)	привод, управляющее устройство
drive (v)	приводить в движение
hydraulic (adj)	гидравлический
fluid (n)	жидкость
pump (n)	насос
pneumatic (adj)	пневматический
compress (v)	сжимать
valve (n)	клапан
5. circuit (n)	(электрическая) схема, цепь
6. end effector (n)	рабочий орган
outfit (v)	оснащать, оборудовать
arc-welder (n)	аппарат для дуговой сварки
blowtorch (n)	паяльная горелка
drill (n)	сверло
gripper (n)	захват, зажим, клещи
spray painter (n)	распылитель краски
7. move (v)	передвигать
carry (v)	переносить, перемещать
grasp (v)	удерживать
manipulate (v)	манипулировать
pivot (v)	поворачивать

spin (v)	вращать
8. assemble (v)	собирать
assembly line (n)	сборочный конвейер
tighten (v)	завинчивать, затягивать
plaster (v)	штукатурить
weld (v)	сваривать
9. sensor (n)	датчик
10. adapt (v)	адаптироваться
autonomous (adj)	автономный, независимый
teleoperated (adj)	управляемый дистанционно
11. locomotion (n)	передвижение
joint (n)	сустав, сочленение
leg (n)	нога
snake (n)	змея
track (n)	гусеница, трак
tread (n)	звено гусеницы
wheel (n)	колесо
12. terrain (n)	местность, ландшафт, рельеф
confined (adj)	ограниченный, замкнутый, изолированный
rough (adj)	шершавый, неровный
smooth (adj)	гладкий
13. aerial (adj)	воздушный, летающий
hover (v)	зависать в воздухе
14. construction (n)	строительство
exploration (n)	изучение
inspection (n)	осмотр
research (n)	исследование
surgery (n)	хирургия
surveillance (n)	наблюдение, слежение
15. assist (v)	содействовать, помогать
augment (v)	приумножать, наращивать, дополнять
mimic (v)	копировать, имитировать
swarm (v)	роиться, собираться в стаи
16. accurate (adj)	верный, безошибочный
delicate (adj)	тонкий, сложный
precise (adj)	точный

6.1 Read the quote and comment on it

“Man is a robot with defects.” (*Emile M. Cioran*)

6.2 Read the text and fill in the table

What I knew before reading the text	What I learned from the text	What made me look at what I knew from a different angle
1. ...	1. ...	1. ...

ROBOTS AT WORK

The term *robot* comes from the Czech word *robota*, generally translated as “forced labor.” This describes the majority of robots fairly well. Most robots in the world are designed for heavy, repetitive manufacturing work. They handle tasks that are difficult, dangerous, or boring to human beings.

For example, the robotic arm is frequently used in manufacturing roles. Its job is to move an end effector from place to place. You can outfit robotic arms with all sorts of end effectors, which are suited to a particular application. One common end effector is a simplified version of the hand, which can grasp and carry different objects. Other end effectors include blowtorches, drills and spray painters.

Most industrial robots work in auto assembly lines, putting cars together. Robots can do a lot of this work more efficiently than human beings because they are so precise. They always drill in the same place, and they always tighten bolts with the same amount of force, no matter how many hours they’ve been working. Manufacturing robots are also very important in the computer industry. It takes an incredibly precise hand to put together a tiny microchip.

You may find robots working alongside construction workers, plastering walls accurately and faster than a human can do the job. Robots assist in underwater exploration. Surgeons use robots to handle delicate surgeries. They even handle flipping burgers in the kitchen. These robots all have a form of robotic arm.

Robotic arms are relatively easy to build and program because they only operate within a confined area. Things get a bit trickier when you send a robot out into the world.

First, the robot needs a working locomotion system. If the robot only needs to move over smooth ground, wheels are often the best option. Wheels and tracks can also work on rougher terrain. But robot designers often look to legs instead, because they are more adaptable. Building legged robots also helps researchers understand natural locomotion – it’s a useful exercise in biological research.

Designers commonly look to the animal world for robotic locomotion ideas. Six-legged insects have exceptionally good balance, and they adapt well to a wide variety of terrain. Four-legged robots such as Boston Dynamics’ Spot look like dogs, and the similarity breeds comparisons as they take on dangerous jobs such as construction inspection.

Aerial robots are also inspired by real-world examples. Although many use wings like we see on airplanes, researchers have also developed techniques using fly-wing-like soft actuators. Most people now are familiar with the propeller-powered drones that provide amazing camera shots for entertainment, sporting events, and surveillance. Some of these hovering bots can also be networked together to create swarms of robots such as those seen at the Tokyo Summer Olympic Games in 2021.

Underwater, robots may walk across the sea floor. One example is Silver2, a crab-like robot designed to find and clean up plastic waste. The Benthic Rover II uses treads instead. Snake robots, which of course take their name from the animals whose locomotion they copy, can operate underwater and on land. They even work well in the human body, where they can perform surgical repairs.

6.3 Choose the correct option. Prove your choice with the corresponding lines of the text

1. The origin of the word *robot* suggests that robots
 - a) can work better than humans.
 - b) can only work and do not have feelings.
 - c) are mechanical.
 - d) are designed to do work that humans can't or don't want to do.
2. The robotic arm
 - a) cannot be reprogrammed for performing different tasks.
 - b) can perform a variety of operations depending on its end effector.
 - c) has capabilities exceeding those of a human hand.
 - d) is the exact copy of the human hand.
3. Manufacturing robots are very important in the computer industry because
 - a) they are precise.
 - b) they are smaller than humans.
 - c) they always apply the same amount of force.
 - d) they don't get tired.
4. What do construction, medical, and kitchen robots have in common?
 - a) They all are faster than humans.
 - b) They all are more accurate than humans.
 - c) They all have the same shape.
 - d) They all work alongside humans.
5. Why do designers develop robots with legs?
 - a) Because wheels and tracks do not work on rough terrain.
 - b) Because people always want to solve more difficult problems.
 - c) Because legs do less harm to natural environments than wheels or tracks.
 - d) Because a legged robot is more versatile.
6. What number of legs is the best option for a robot designed to work in a variety of terrain?
 - a) two
 - b) four
 - c) six
 - d) eight
7. Which of the following are propeller-powered drones **not** capable of?
 - a) flapping their wings
 - b) hovering
 - c) swarming
 - d) taking photos
8. Silver2 underwater robot
 - a) moves on tracks
 - b) moves on legs

- c) moves like a snake
- d) is a robotic arm

6.4 Find the English equivalents of the following phrases in the text

1. происходить от чешского слова
2. выполнять сложные, опасные или неинтересные для человека задачи
3. подходить для конкретного применения
4. упрощенный вариант руки
5. сверлить в одном и том же месте
6. затягивать болты с одинаковым усилием
7. относительно просто собрать и запрограммировать
8. работать в ограниченном пространстве
9. обратиться к миру животных в поисках идей для передвижения роботов
10. обладать исключительным равновесием
11. хорошо адаптироваться к самым разным ландшафтам
12. браться за опасную работу
13. беспилотные летательные аппараты с винтовым двигателем
14. объединяться в сеть для формирования роя роботов
15. работать под водой и на суше

6.5 Find words in the text whose meaning is similar to the meaning of the following words

- | | | | | |
|--------------|-------------|---------------|-----------------|----------------|
| 1. work | 4. accurate | 7. skillful | 10. to motivate | 13. to hang |
| 2. to manage | 5. quantity | 8. limited | 11. method | 14. crowd |
| 3. to equip | 6. to help | 9. to conform | 12. observation | 15. to execute |

6.6 Find words in the text whose meaning is opposite to the meaning of the following words

- | | | | | |
|--------------|-------------|----------------|--------------|--------------|
| 1. voluntary | 3. exciting | 5. complicated | 7. to loosen | 9. fictional |
| 2. safe | 4. seldom | 6. to release | 8. rough | 10. ignorant |

6.7 a) Match the adjectives / nouns and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Adjective / Noun	Noun
1. forced	a) area
2. repetitive	b) event
3. end	c) exploration
4. spray	d) example
5. assembly	e) effector
6. underwater	f) floor
7. delicate	g) job
8. confined	h) locomotion

9. natural	i) line
10. animal	j) labor
11. dangerous	k) painter
12. real-world	l) surgeries
13. sporting	m) world
14. sea	n) work

b) Match the verbs and the nouns to form all possible word combinations. Make sentences of your own with the word combinations

Verb	Noun
1. to handle	a) bolts
2. to grasp	b) camera shots
3. to tighten	c) objects
4. to plaster	d) surgical repairs
5. to provide	e) tasks
6. to perform	f) walls

6.8 Find the corresponding prepositions for the following verbs and phrases in the text. Make sentences of your own where the verbs and phrases are used in combination with the prepositions

- | | |
|------------------------------|--------------------------|
| 1. to be used _____ | 7. to look _____ |
| 2. to outfit something _____ | 8. to adapt _____ |
| 3. to be suited _____ | 9. to be inspired _____ |
| 4. to put something _____ | 10. to be familiar _____ |
| 5. to assist _____ | 11. to walk _____ |
| 6. to move _____ | |

6.9 Match the words and their definitions

Word	Definition
1. actuator	a) to turn round and round rapidly, or make something turn round and round rapidly
2. assembly line	b) to turn or twist
3. to augment	c) a substance (such as a liquid or gas) tending to flow or conform to the outline of its container
4. autonomous	d) the place where parts or pieces of something are joined together
5. drone	e) to increase the size or value of something by adding something to it
6. end effector	f) to imitate closely
7. fluid	g) ground or a piece of land seen in terms of its surface features or general physical character

8. joint	h) a mechanical device for moving or controlling something
9. to mimic	i) a device that responds to a physical stimulus (such as heat, light, sound, pressure, magnetism, or a particular motion) and transmits a resulting impulse (as for measurement or operating a control)
10. to pivot	j) a device that controls the flow of gas or liquid from one place to another
11. sensor	k) any attachment on the end of a robot that interacts with the environment, such as a tool to manipulate objects
12. to spin	l) an arrangement of machines, equipment, and workers in which work passes from operation to operation in direct line until the product is assembled
13. terrain	m) an aircraft operated by remote control or onboard computers, especially an unmanned aerial vehicle (UAV)
14. valve	n) able to operate without being controlled directly by humans

6.10 Complete the text with words from the list below. Try to summarize the content of the text in 40 words or less

batteries bodies bones camera computer (x2) electrical fluid joints motors (x2) movement pivot pneumatic (x2) power (x2) reprogrammable sensory spin

Most robots have movable **1** _____. Some only have motorized wheels, and others have dozens of movable segments, typically made of metal or plastic. Like the **2** _____ in your body, the individual segments are connected together with **3** _____.

Robots **4** _____ wheels and **5** _____ jointed segments with some sort of actuator. Some robots use electric **6** _____ and solenoids as actuators; some use a hydraulic system; and some use a **7** _____ system (a system driven by compressed gases). Robots may use a combination of all these actuator types.

A robot needs a **8** _____ source to drive these actuators. Most robots either have **9** _____ or plug into the wall. Some may use solar **10** _____ or fuel cells. Hydraulic robots also need a pump to pressurize the hydraulic **11** _____, and **12** _____ robots need an air compressor or compressed-air tanks.

The actuators are all wired to **13** _____ circuits. The robot's **14** _____ controls everything attached to the circuits. To move the robot, the **15** _____ switches on all the necessary **16** _____ and valves. Many robots are **17** _____ – to change the robot's behavior, you update or change the software that gives the robot its instructions.

Not all robots have **18** _____ systems, and few can see, hear, smell or taste. The most common robotic sense is the sense of **19** _____ – the robot's ability to monitor its own motion. One way to do this is to use a laser on the bottom of the robot to illuminate the floor while a **20** _____ measures the distance and speed traveled.

6.11 Translate into English

1. Робот – это управляемая компьютером машина, запрограммированная на перемещение объектов, манипулирование ими и выполнение работы во взаимодействии с окружающей средой.
2. Роботы способны выполнять повторяющиеся задачи быстрее, точнее и с меньшими затратами, чем люди.
3. Термин «робот» происходит от чешского слова «robota», означающего «принудительный труд». Он был впервые использован в пьесе «R.U.R. (Rossum's Universal Robots – Универсальные роботы Россума)», написанной в 1921 году чешским писателем и драматургом Карелом Чапеком.
4. С тех пор слово «робот» используется для обозначения машины, которая выполняет работу по оказанию помощи людям или работу, которую люди считают трудной или нежелательной.
5. Создание состоящей из множества звеньев искусственной руки, или манипулятора, привело к появлению современного робота.
6. Многие роботы оснащены специальными захватами или рабочими органами, имитирующими функции и строение человеческой руки.
7. С помощью таких захватов роботы могут удерживать различные устройства, например, подставку с пробирками или аппарат для дуговой сварки.
8. Роботы широко используются в промышленности и частично заменили человеческий труд.
9. В автомобильной промышленности роботы используются для выполнения различных операций на конвейере: они сверлят отверстия одинакового размера точно в одних и тех же местах, затягивают болты в соответствии с конструктивными особенностями автомобиля и выполняют множество других производственных операций.
10. Роботы применяются хирургами для установки искусственных суставов, а высокоточные роботы могут ассистировать при проведении сложных операций на глазах.
11. Автономные роботы способны анализировать незнакомые условия и приспосабливаться к ним, даже на пересечённой местности.
12. Робот-планетоход, например, может составить карту местности перед собой на основе информации, полученной от оптических датчиков.

6.12 Think of the engineering discipline you are being trained in and answer the following questions

1. Are robots already part of the area? If yes, how are they used?
2. If robots are not used in the area now, do they have any prospects in it? What kind of prospects do they have?
3. What are the possible advantages and disadvantages of using robots in the area?
4. How may using robots affect the area in the future?

6.13 Listen to the information about different types of robots and put these examples of robots into the appropriate group

Atlas drones exoskeletons mechanical arm prosthetic limbs
Roomba Sophia submarines

1. pre-programmed robots
2. humanoid robots
3. autonomous robots
4. tele-operated robots
5. augmenting robots

6.14 Listen again and fill in the table

Type of robot	Functions	Capabilities
1. pre-programmed robots		
2. humanoid robots		
3. autonomous robots		
4. tele-operated robots		
5. augmenting robots		

6.15 Design a robot you would like to exist. When telling about it, answer the following questions

1. What tasks will the robot handle?
2. What type of robot will it be?
3. What parts will it consist of? How will they work? How will they be powered?
4. What materials will be used to build it?
5. Will it be possible to introduce such robots on a wide scale? If so, how will they affect people's lives? If not, why?
6. What do you think of the feasibility of your project as a whole?

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