Міністерство освіти і науки України
Державний університет «Житомирська політехніка»

О. В. Свисюк

FLUENT IN AUTOMATION:
ESSENTIAL ENGLISH FOR FUTURE ENGINEERS

Житомир
2024

УДК 811.111:64.011.22:005.591.6
С24

Рекомендований до друку Вченою радою Державного університету «Житомирська політехніка» (протокол №12 від 28 жовтня 2024 р.)

Рецензенти:

Щерба Н. С. − доктор педагогічних наук, доцент, професор кафедри міжкультурної комунікації та іншомовної освіти Житомирського державного університету імені Івана Франка

Кубрак С. В. − кандидат педагогічних наук, доцент, завідувач кафедри іноземних мов Поліського національного університету

Гайдай І. О. – кандидат педагогічних наук, доцент, в.о. завідувача кафедри педагогічних технологій та мовної підготовки Державного університету «Житомирська політехніка»

Свисюк О. В.

С24 “Fluent in Automation: Essential English for Future Engineers”: навчальний посібник з англійської мови для студентів спеціальності 174 «Автоматизація, комп’ютерно-інтегровані технології та робототехніка» / О. В. Свисюк. − Електронні дані. − Житомир: Державний університет «Житомирська політехніка», 2024. – 196 с.
ISBN 978-966-683-661-1

Мета посібника – забезпечити розвиток навичок роботи з фаховою літературою та навичок усного мовлення на теми, передбачені програмою з іноземних мов для вищих навчальних закладів.

Посібник охоплює широкий спектр тем, пов'язаних із загальнонауковою лексикою та технологією автоматизації. До складу посібника входять 18 розділів, які поступово вводять читача у світ автоматизації, починаючи з основної наукової лексики, продовжуючи сучасними досягненнями в галузі автоматизації, принципами зворотного зв'язку та машинного програмування.

Книга містить тести для самоперевірки, ключі до граматичних та лексичних тестів, важливі технічні питання та їх пояснення, а також словник ключових даних. Це робить посібник корисним інструментом для вивчення та практичного застосування знань в області автоматизації.

УДК 811.111:64.011.22:005.591.6

ISBN 978-966-683-661-1

CONTENT

INTRODUCTION

Welcome to “Fluent in Automation: Essential English for Future Engineers,” a comprehensive guide designed to equip you with the essential language skills needed for success in the rapidly evolving field of automation. Whether you are a student at the beginning of your academic journey, or an enthusiast eager to deepen your understanding of automation technology, this book aims to bridge the gap between technical expertise and effective communication.

The Importance of English in Automation Technology

In today's globalized world, English has become the lingua franca of science, technology, and business. As automation technology continues to revolutionize industries, the ability to communicate complex technical concepts clearly and effectively in English is more critical than ever. This skill not only enhances collaboration with international teams but also opens doors to global opportunities and advancements in your career.

What This Book Offers

1. Technical Vocabulary Development: Gain a robust understanding of key terms and phrases specific to automation technology. Each chapter introduces and reinforces technical vocabulary through context-based learning, ensuring you can apply these terms accurately in both written and spoken communication.
2. Real-World Scenarios: Engage with practical examples and scenarios that reflect real-world applications of automation technology. These examples help you connect theoretical knowledge with practical usage, making your learning experience more relevant and impactful.
3. Communication Skills: Develop essential speaking, listening, reading, and writing skills tailored to the needs of automation technology professionals. From presenting technical reports to participating in team meetings and writing documentation, this book covers all aspects of professional communication.
4. Grammar and Structure: Strengthen your grasp of English grammar and sentence structure to improve clarity and precision in your communication. Special focus is given to common challenges faced by non-native speakers in the technical domain.
5. Interactive Exercises: Benefit from a variety of exercises and activities designed to reinforce learning and encourage active participation. These exercises include vocabulary drills, comprehension questions, discussion prompts, and writing assignments.

How to Use This Book

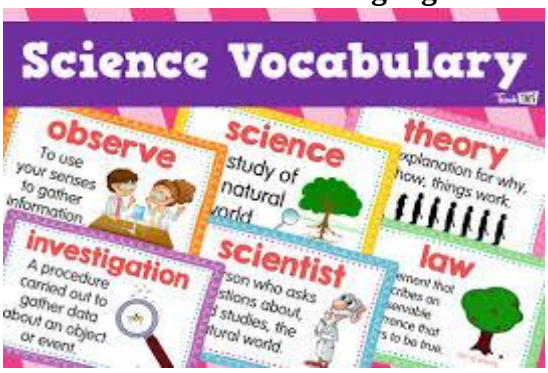
This book is structured to provide a progressive learning experience. Each chapter builds upon the previous one, gradually expanding your knowledge and skills. It is recommended to follow the chapters in sequence to maximize your understanding and retention. However, you can also use this book as a reference guide, jumping to specific sections as needed.

Embarking on a career in automation technology is an exciting and challenging journey. Mastering the language of this field is an essential step towards achieving your goals and contributing to the technological advancements shaping our future. We hope this book empowers you with the confidence and competence to communicate effectively and excel in your studies and professional endeavors.

Welcome to the world of automation technology. Let's begin this journey together!

INTRODUCTION TO GENERAL SCIENTIFIC LEXIS (PART I)

Take a close look at the language of research and discovery which can be effectively used in your professional activity. Pay attention to how the key words are explained and memorise them.



SCIENCE AND SCIENTISTS

Science is the study of the nature and behaviour of natural things and knowledge obtained about them.

Scientific describes words that relate to science.

A scientist is someone who works in science.

(from *Key Words in Science and Technology* by B. Mascull)

Read the text and do the tasks below.

OPINION: THE FUTURE OF SCIENCE IS AUTOMATION

The man who first proposed the concept of a "Robot Scientist," Professor Ross King of Cambridge's Department of Chemical Engineering and Biotechnology, explains why he thinks artificial intelligence (AI)-powered scientists could outperform the best human scientists by the middle of the century, but only if AI for science is developed in an ethical and responsible manner.

The capacity to travel, the broad availability of food and healthcare, as well as several other scientific and technical advancements, have allowed billions of people to live better lives than those of rulers from centuries before.

Of course, despite all of our achievements and progress made, the 21st century still presents numerous difficulties for the world. Various diseases, pandemics, poverty and starvation, climate change are only a few of the challenges people face with.

We might be able to deal with and overcome these issues if all the nations came together to pool resources and technology. But there is no precedent for such cooperation in history, and there is little reason for optimism given the state of world politics now.

Increasing the productivity of research and technology is our best chance of overcoming these obstacles. Laboratory automation and artificial intelligence (AI) are the only practical ways to do this.

AI programs are already characterised by superhuman scientific abilities. They are able to learn from enormous datasets and retain vast amounts of information. They are capable of almost perfect probabilistic thinking as well as perfect logical reasoning.

The majority of laboratory jobs that people currently perform in the lab can now be completed by robots thanks to advancements in laboratory automation. The idea of "Cloud Labs" is also starting to take shape at this point. The goal is to enable large-scale, remote laboratory automation. Scientists would transmit their samples to the cloud lab and use a computer interface to plan and carry out their research.

Next are AI scientists, often referred to as "robot scientists" or "self-driving labs," who use AI systems in conjunction with automated laboratory processes to carry out closed-loop automation of scientific research. These systems automatically generate hypotheses to account for observations, plan experiments to test these theories, use laboratory robots to physically conduct these tests, analyse and assess the results, and then repeat the process.

Compared to humans, AI scientists can work longer and quicker, more accurately and more cheaply. Because the computer designs and conducts the tests automatically, every step of the scientific method may be fully recorded and digitally curated, increasing the reproducibility of the findings. Currently, there are about 100 AI scientists working in fields ranging from chemistry to medicine, astrophysics to quantum mechanics.

(Adapted from https://www.cam.ac.uk/research/news/opinion-the-future-of-science-is-automation)

Task 1. Match the words from the text with their definitions.

1. Precedent	a. The ability to obtain consistent results when an experiment is repeated.
2. Probabilistic	b. A previous occurrence or action that is regarded as an example or guide to be considered in subsequent similar circumstances.
3. Automation	c. Organized and maintained for use.
4. Reproducibility	d. The process of making something operate automatically without human intervention.
5. Hypotheses	e. A large collection of data typically used for analysis.
6. Curated	f. Reasoning based on the likelihood or probability of events.
7. Datasets	g. A place equipped for experimental study in a science or for testing and analysis.
8. Interface	h. An arrangement or system through which something interacts with another.
9. Enormous	i. Tentative explanations that can be tested by further investigation.
10. Laboratory	j. Extremely large in size or amount.

Task 2. Multiple Choice Questions: Choose the correct answer based on the text.

1. What is the main benefit of laboratory automation?
   a. It increases the number of jobs for humans.
   b. It allows for remote laboratory work.
   c. It reduces the cost of building laboratories.
   d. It eliminates the need for scientific research.

2. Why is there little reason for optimism about global cooperation?
   a. Nations do not have the technology needed.
   b. There is no historical precedent for such cooperation.
   c. Countries are facing economic challenges.
   d. World politics are currently stable.

3. What can AI scientists do that human scientists cannot?
   a. Conduct manual experiments
   b. Generate hypotheses and plan experiments
   c. Work at a slower pace
   d. Avoid the need for any data

4. What is a "Cloud Lab"?
   a. A laboratory located in the clouds.
   b. A concept allowing remote laboratory automation.
   c. A new form of traditional laboratory.
   d. A type of AI program.

Task 3. Indicate whether the following statements are true or false based on the text.

1. The 21st century presents no major challenges to the world. **True** **False**
2. AI programs are capable of perfect logical reasoning. **True** **False**
3. The idea of "Cloud Labs" is only theoretical and has not started to take shape. **True** **False**
4. AI scientists can increase the reproducibility of scientific findings. **True** **False**
5. There are currently more than 500 AI scientists working in various fields. **True** **False**

TECHNOLOGY AND TECHNOLOGISTS

Technology describes scientific knowledge applied for practical purposes.
Technological describes things relating to technology.
Technologists are researchers who work in a particular area of technology.

INNOVATION

Innovation is the act of thinking of new ideas, developments, and improvements.

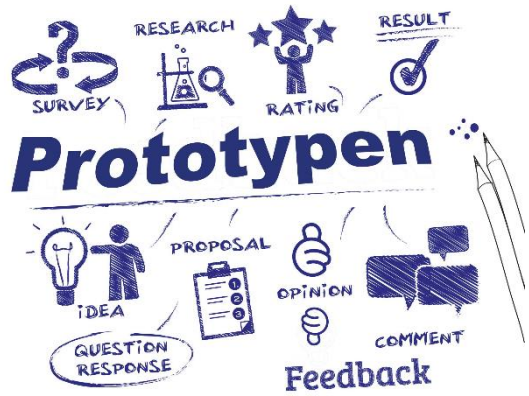
These are **innovations** and the people **innovating** them are **innovators.** The related adjective is **innovative.**

The first, **experimental,** versions of a new technological idea are **prototypes** (e.g., a prototype version).

(from *Key Words in Science and Technology* by B. Mascull)

Read the text and do the exercises below.

WHAT IS MEANT BY A PROTOTYPE?



The word *prototype* comes from the Latin words *proto,* meaning original, and *typus*, meaning form or model.

A prototype is a pre-production form of a product that serves as the basis for further iterations. These test versions of a new product, service, or technology are frequently made by engineers and product developers prior to its release.

Prototypes do not represent the finished item or service. Rather, they provide a means to test a concept, authenticate the operational procedure, and pinpoint methods to enhance the product prior to making it available to the general public. The prototype may be tested further by being nudged, hurled against a wall, and other actions. It is more likely to satisfy consumers if it passes these tests. Should the process of prototyping uncover defects, the product may be discarded.

IT PROTOTYPES

Prototyping in IT can take many different forms, depending on the service or product being developed:

Software Development. A prototype is a basic functional model of a product or information system that is often constructed as a part of the development process or for demonstration. A basic version of the system is constructed, tested, and then modified as needed until an acceptable prototype is reached, from which the entire system or product is produced, according to the systems development lifecycle prototyping model.

Programming. Prototype-based programming creates unique objects. The prototype is then copied, and alterations are made based on what is found when the code is tested and its execution is observed.

Hardware Design. When designing a new equipment, such a network router or server, designers may conceptualize and test their ideas by making a hand-built model or prototype that closely resembles a finished product.

Task 4. Choose the correct answer based on the text.

1. What is the origin of the word "prototype"?
   a. Greek words proto and typus
   b. Latin words proto and typus
   c. French words proto and typus
   d. English words proto and typus

2. What is the main purpose of a prototype?
   a. To serve as the final product for consumers
   b. To act as a basic version for testing and improvement
   c. To replace the original concept entirely
   d. To be sold directly to the public

3. How are prototypes typically tested?
   a. By being shown to the public for feedback
   b. By being integrated into the final product
   c. By being subjected to rigorous tests like being nudged or thrown against a wall
   d. By being used only in theoretical models

4. In the context of software development, what is the role of a prototype?
   a. To be a final version of the software
   b. To be a simple functional model for testing and modification
   c. To be a part of the marketing strategy
   d. To be discarded after initial use

5. What does prototype-based programming involve?
   a. Creating a finished product from scratch
   b. Developing a basic model and selling it directly
   c. Making unique objects that are copied and modified based on testing
   d. Designing theoretical concepts without practical testing

6. In hardware design, how is a prototype used?
   a. As a blueprint for marketing strategies
   b. As a hand-built model to conceptualize and test ideas
   c. As the final version sent to consumers
   d. As an intangible concept only

COLLOCATIONS WITH "PROTOTYPE"

1. Prototype model
2. Prototype development
3. Prototype testing
4. Prototype design
5. Prototype stage
6. Prototype version
7. Prototype creation
8. Prototype process
9. Prototype demonstration
10. Prototype production

Task 5. Fill in the blanks with the appropriate collocation.

1. The engineers completed the _____ and were ready to move on to the next phase.
2. _____ is a crucial step before releasing the product to the market.
3. The _____ of the new app was presented to the stakeholders.
4. After the _____, several improvements were made to the design.
5. The _____ was approved, allowing for mass production to begin.
6. During the _____, unexpected issues were discovered and resolved.
7. _____ involves creating a preliminary version to explore potential design flaws.
8. The team focused on _____ to ensure the product met all requirements.
9. The new technology went through rigorous _____ before finalizing.
10. _____ requires a multidisciplinary approach to bring the concept to life.

Task 6. Match the beginnings of the sentences (Column A) with their endings (Column B).

Column A	Column B
1. The initial ____	a. prototype design includes user feedback.
2. Successful ____	b. prototype testing revealed some flaws.
3. Detailed ____	c. prototype model was created last year.
4. During the ____	d. prototype production phase, we encountered delays.
5. The software ____	e. prototype development can reduce costs.

Task 7. Indicate whether the following statements are true or false.

1. Prototype testing is the final stage before product release.	**True**	**False**
2. Prototype design involves creating a finished product.	**True**	**False**
3. Prototype development is not necessary for simple products.	**True**	**False**
4. Prototype demonstration can help secure funding for further development.	**True**	**False**
5. The prototype version is usually the last version of the product.	**True**	**False**

SPEAKING ACTIVITIES

Activity 1: Group Discussion "The concept and importance of prototypes"

The class is divided into small groups of 3-4 students. Each group discusses the following questions:

- What is a prototype, and why is it important in product development?
- How do prototypes help in improving a product before its release?
- Can you think of examples of prototypes you have seen or heard about?
- What might be some challenges faced during the prototyping process?

After 10-15 minutes of discussion, each group shares their insights with the class.

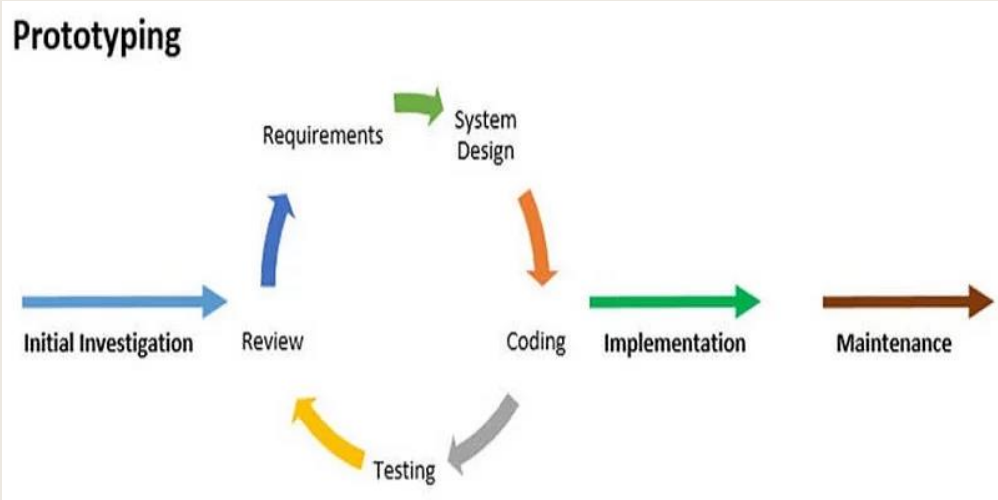
Activity 2:

Role-Play

Student A plays the role of an engineer or product developer. The "engineer" explains their prototype, including its purpose, the testing process, and any challenges faced during development.

Students B plays the role of a stakeholder or investor. The "stakeholder" asks questions about the prototype's functionality, testing methods, and potential improvements.

Activity 3:
Presentation



Each student prepares a 3–5-minute presentation on one aspect of prototyping (e.g., software development, programming, hardware design).
The presentation should include:

- Definition and purpose of a prototype
- Steps involved in creating and testing a prototype
- Specific examples or case studies

Students present to the class, followed by a Q&A session where classmates ask questions about the presentation.

UNIT 2.

INTRODUCTION TO GENERAL SCIENTIFIC LEXIS (PART II)

INVENTORS

Invention or **inventiveness** is the ability to design new machines, devices, or products.

An **invention** is a new machine, device, or product.

People who invent things are **inventors.** The related adjective is **inventive.**

RESEARCHERS

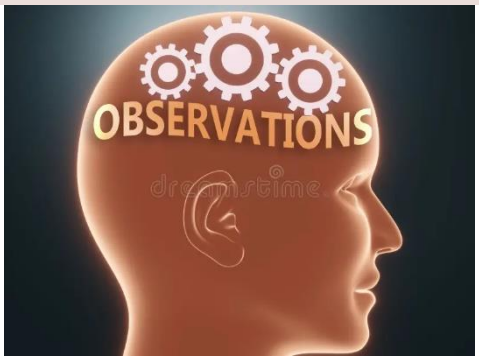
People trying to find facts about something, **study** it or do **research** in it, into it, or on it.

A piece of research may be referred to as a **study** or a **research study.** These terms also refer to the published results of the research.

Scientific research often takes place in **laboratories,** or labs. There are also **research laboratories** or research labs.

People doing research are **researchers.**

OBSERVATION AND HYPOTHESIS



A phenomenon is something that is seen to occur or exist: it is observed.

Information obtained by making observations and making measurements of them is **data.** Data is collected or gathered. It is then processed and analyzed in a process of analysis. Unprocessed, unanalyzed data is **raw data.**

Scientists look for meaning in data: they interpret it in order to reach conclusions or to conclude things. Data and other information form the evidence for these conclusions.

*The form data can be used as a singular or plural. Sometimes **datum** is used for the singular.*

An experiment may be done to test a hypothesis: to see whether a suggested explanation for something is true.

Approaching scientific problems by hypothesizing about them and testing these hypotheses by observation and experimentation is often described as being empirical.

(from *Key Words in Science and Technology* by B. Mascull)

Read the text and do the task below.

Throughout human history, there has always been a catalyst for advancement. These tech pioneers of the twenty-first century — Elon Musk, Steve Jobs, Sheryl Sandberg, Mark Zuckerberg, and Sheila Lirio Marcelo — are bringing about new experiences in travel, social interaction, and getting professional assistance.

1. Elon Musk (born in 1971 in South Africa)	He sold his first piece of software after teaching himself how to program at the age of 12. Since then, Musk has founded a number of businesses and is researching methods to transform both terrestrial and space travel. His businesses, Space Exploration Technologies Corporation, also known as SpaceX, and Tesla Motors, are his most well-known ventures. SpaceX was founded with the goal to construct spaceships for use in commercial space travel. SpaceX launched the Dragon spacecraft in 2012. It made a safe return to Earth after docking with the International Space Station and exchanging cargoes. Since then, Dragon has made many cargo deliveries and is scheduled to begin carrying humans as part of NASA's Commercial Crew Program.
2. Steve Jobs (born in San Francisco, California in 1955)	Job's hobby (working on electronics in a family garage) eventually aided in the 1976 founding of *Apple Computer* with co-founder Steve Wozniak. 1986 – purchase of the animation studio (later known as *Pixar Animation Studios*). Because of the confidence in the company, he contributed $50 million of his own funds. After the premiere of Toy Story, Pixar developed other successful films. Following the studio's 2006 merger with Disney, Jobs became the studio's largest stakeholder. 1997 – return to Apple as CEO. Apple has brought innovative products to market that have shaped the direction of current technological development. Jobs realized the necessity for a legal music download option after the first-generation iPod was introduced in 2001. Eventually it led to the creation of iTune. One million songs were sold in the first week of the iTunes store's launch, and it quickly became popular and completely altered the music industry. Following the debut of the iPhone and iPad, Apple introduced iCloud, which enables users to synchronize media, documents, and email across all platforms, and the App Store, which ushered in a new era of mobile software.
3. Sheryl Sandberg (born in 1969 in Washington D.C.)	Graduated from the Harvard Business School with her M.B.A degree. During the Clinton presidency – served as the Treasury Department's chief of staff. Following her tenure in the government, she moved to Silicon Valley and became one of the nation's leading top executives. She is included as one of *Time's 100 Most Influential People in the World* and on *Fortune's list of the 50 Most Powerful Women in Business*. 2001 – joined *Google* to work as the vice president of worldwide online sales and operations. She was in charge of overseeing the internet sales of publishing and advertising goods. 2008 – left Google to become the COO of *Facebook*. In particular, Sandberg assists Facebook in growing its business and reaching a wider worldwide audience. Sandberg is in charge of Facebook's business operations. She was also elected as the company's first female director.
4. Mark Zuckerberg (born in 1984 in White	He had an early interest in computers. Studying at Harvard University, Zuckerberg founded a website with three friends in a dorm room. The site enabled users upload images, establish profiles, and interact with other users. Known as *The Facebook*, the company operated until June 2004, when Mark Zuckerberg left college to work full-time on Facebook. Facebook provided individuals with a new

Plains, New York)	means of communication and connection. Facebook's ability to share videos and articles altered the way people get their news. Mark Zuckerberg was selected Person of the Year by Time in 2010, and in May of 2013, he became the youngest CEO to appear on the Fortune 500.
5. Sheila Lirio Marcelo (born in the Philippines, 1970)	Education – received M.B.A. (Master of Business Administration) and J.D. Doctor of Jurisprudence) degrees, with honors and the Dean's Award from Harvard University. 2006 – launched *Care.com*, a revolutionary job site that links caregivers with employers offering fair salary. Care.com expanded to become the most well-known international marketplace that connects families with carers. With Care.com growth and development, Marcelo has won many awards, such as Fortune's Top 10 Women Entrepreneurs and the Filipino Heritage Award from Philippine President Benigno Aquino III. 2021 – started a new business and co-founded *Proof of Learn*, a business that uses cutting-edge technology to have a positive social effect. Motivated by the goal of using blockchain and AI advancements to democratize high-quality education worldwide, her project demonstrates her dedication to transformative solutions even more.

Task 1. Match the following terms related to the abstract with their correct definitions.

TERMS	DEFINITIONS
1. Program	A. Joining together of two companies to form one
2. Terrestrial	B. Goods carried on a ship, aircraft, or vehicle
3. Docking	C. The first public performance of a play, movie, or piece of music
4. Cargo	D. Pertaining to the Earth or land
5. Stakeholder	E. To write code or software for computers
6. Merger	F. Pertaining to business or commerce
7. Synchronize	G. To cause to occur or operate at the same time or rate
8. Premiere	H. A person with an interest or concern in a business
9. Innovative	I. The act of two spacecraft joining together in space
10. Commercial	J. Featuring new methods or original ideas

Task 2. Complete the sentences using the correct term from the word bank.

program	***terrestrial***	***docking***	***cargo***	***stakeholder***
merger	***synchronize***	***premiere***	***innovative***	***commercial***

1. Elon Musk sold his first piece of software after teaching himself how to _____.
2. SpaceX aims to transform both _____ and space travel.
3. The Dragon spacecraft made a safe return to Earth after _____ with the International Space Station.
4. The Dragon spacecraft has made many _____ deliveries to the ISS.
5. Steve Jobs became Pixar's largest _____ after its merger with Disney.
6. The _____ between Pixar and Disney occurred in 2006.
7. Apple introduced iCloud to _____ media, documents, and email across all platforms.
8. Toy Story had its _____ in 1995 and became a huge success.
9. Steve Jobs is known for bringing _____ products to market with Apple.
10. SpaceX constructs spaceships for use in _____ space travel.

Task 3. Form new words by adding prefixes or suffixes to the base terms related to the abstract. Write example sentences with 4 of them.

BASE TERMS	NOUN	VERB	ADJECTIVE
1. Program 2. Innovate 3. Synchronize 4. Commercial 5. Premiere	……, programming		

Task 4. A. Study the definitions to the following terms related to innovations.

TERMS	DEFINITIONS
1. Disruptive Innovation	Innovation that significantly alters or disrupts an existing market or industry;
2. Breakthrough Technology	A technological advance that fundamentally changes an industry or creates a new market;
3. Prototype	Early sample or model built to test a concept or process;
4. Crowdsourcing	Practice of obtaining input or ideas from a large group of people, typically via the Internet;
5. Sustainable Development	Development that meets present needs without compromising the ability of future generations to meet their needs;
6. Blockchain	A system of decentralized digital records or ledgers;
7. Artificial Intelligence	Computing systems able to perform tasks typically requiring human intelligence;
8. Venture Capital	Investment funds that manage money from investors seeking private equity stakes in startups;
9. Internet of Things (IoT)	Network of physical objects embedded with sensors, software, and other technologies to connect and exchange data;
10. Augmented Reality (AR)	An interactive experience where real-world environments are enhanced by computer-generated perceptual information.

B. Complete the sentences using the correct term from the word bank.

WORD BANK

innovation	***prototype***	***AI***	***venture capital***	***disruptive***
blockchain	***AR***	***IoT***	***crowdsourcing***	***sustainable***

1. The _____ developed by the company allowed for real-time monitoring of environmental conditions.
2. By using _____, companies can gather a wide range of ideas and solutions from the public.
3. A _____ innovation can completely change how industries operate, making existing solutions obsolete.
4. The initial _____ of the new device was tested extensively before mass production.
5. _____ development focuses on balancing economic growth with environmental protection.
6. Many tech startups rely on _____ funding to grow their businesses.
7. _____ technology ensures secure and transparent transactions across a decentralized network.

8. Companies are leveraging _____ to create intelligent systems that can analyze data and make decisions.

9. The rise of _____ has connected everyday objects to the Internet, enabling smarter homes and cities.

10. _____ reality technology allows users to overlay digital information onto their real-world environment.

Before preparing for speaking activities, get acquainted with theoretical material and use some of the helpful tips.

A project timeline is a visual representation of tasks and activities organized chronologically to outline the process of working on a project and advise the individuals involved.

Any project needs a plan to achieve its objectives.

Why is it important to create a project timeline?

A project timeline clarifies the goals and makes it easier to monitor and track progress. It also demonstrates how much work has to be completed and acts as the foundation for open communication among the team. Businesses frequently fail to execute clear objectives and communication; thus, they should be viewed as essential components of each project.

A well-constructed project timeline also increases the team's flexibility and adaptability to real-time change. A timeline is a sample plan, and plans tend to alter along the way, so establishing a solid foundation will make changing course less daunting. It will allow you to learn from what has been done up to that point in time and estimate what, if anything, needs to be modified going forward.

Furthermore, a clear project timeline will help you to allocate different tasks and duties to the correct individuals and identify who is willing to step up and acquire new abilities, as well as who can effectively use their expertise to get the greatest outcomes.

The variables of any project timeline

Before creating a project timetable, let's take a short look at the essential factors. Your timeline consists of five primary construction blocks:

Tasks — what has to be done.

The first step in developing a project timetable is to identify the scope of your project. It entails determining the project's ultimate purpose and when it must be completed. Start with defining the project's major objectives in a way that gives a comprehensive, big-picture initiative.

Next, outline the tasks required to achieve it. Breaking down your project into smaller parts is critical for a successful timetable and will serve as a starting point for calculating the remaining variables.

Deadlines — what time limits you have to complete tasks and perform duties.

Estimating the amount of time required to finish each activity is an important component of creating your project timeline since it allows you to validate that the overall deadline is feasible.

Duration — how long it will take to finish the project and individual tasks.

Dependencies — what tasks depend on each other.

When it comes to a project deadline, no task lives alone. Defining the interdependence of the tasks refers to determining their relationship and influence on one another. Once you've broken down a project into smaller tasks, understand what has to be done to complete them, as well as which tasks are dependent on the completion of others. For example, in order to evaluate and update a draft for a blog post, one must first write the draft.

Resources — who can work on the project and what additional resources are required.

After determining which larger and smaller activities must be accomplished to meet your objectives, as well as how much time each particular procedure requires, you must assess the resources available for your project.

A resource can be anything — how many employees are available to work on the project, what equipment or technology is required, what the financial implications are, what other projects are currently underway, and how much knowledge or previous experience the team has, depending on whether or not a similar project has been completed in the past.

Once you know how many resources can be assigned to achieving a project's goals, you may return to the previous phase and determine whether the time allotted for each activity is appropriate.

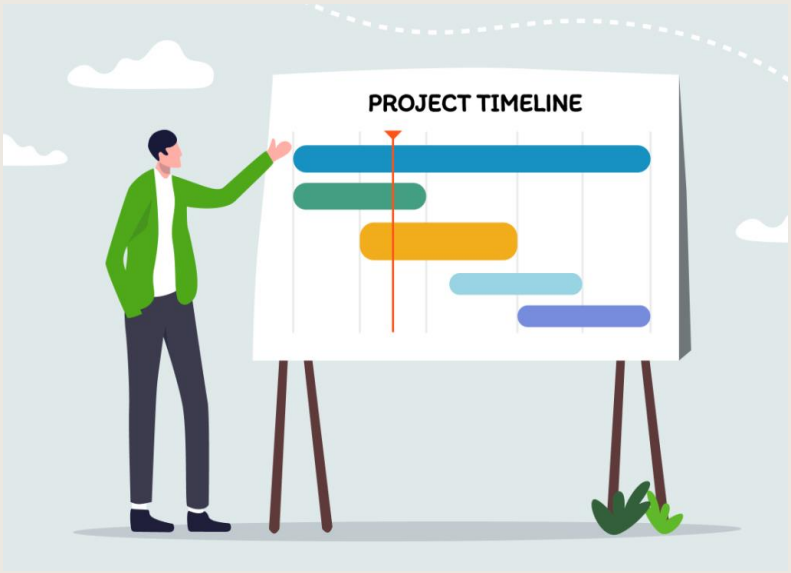
Mark your milestones

Milestones assist to track progress in a clear manner and can be anything that meets the demands of tracking progress for your unique project, such as dates, tasks, or other specific deliverables. The goal of introducing milestones into your project timetable is to help make the project more palatable by dividing it into manageable parts. Each completed phase will offer team members with a sense of success and an additional push of desire to continue moving forward.

Working out an elaborate project timetable may appear to be a difficult undertaking at first. But, in the long run it will increase your team's efficiency and productivity. Remember to thoroughly assess each variable, and don't be afraid to seek help from others if you're still unsure where to start or get lost along the way. Many team members like being engaged in the project planning process and feeling that their contributions are meaningful.

SPEAKING ACTIVITIES

Activity 1: Timeline Creation (Chronological events, achievements)



Create a timeline that chronicles the major events and milestones in the lives of the five individuals mentioned in the abstract. Include their significant achievements, business ventures, and any notable contributions to their respective fields.

Activity 2: Future Innovations	Predict the next big innovation in space travel, inspired by Elon Musk's work with SpaceX. Describe the technological advancements, potential challenges, and the impact on society. How will this innovation transform the future of space exploration and travel?
Activity 3: Comparative Analysis	Compare and contrast the business ventures of Elon Musk (SpaceX, Tesla) and Steve Jobs (Apple, Pixar). Discuss their motivations, challenges, and the impact of their companies on their respective industries. Highlight similarities and differences in their approaches to innovation and leadership.
Activity 4: Problem-solving in leadership roles	Imagine you are Sheryl Sandberg and have just joined Facebook as COO. Facebook is facing a major issue with user data privacy. Develop a strategic plan to address the issue, ensuring user trust and regulatory compliance. Outline your steps and justify your decisions.
Activity 5: Debating the impact of technological advancements	Organize a debate where participants take on the roles of the entrepreneurs mentioned (Elon Musk, Steve Jobs, Sheryl Sandberg, Mark Zuckerberg, and Aicha Evans). The debate topic is "The Most Transformative Technological Innovation of the 21st Century." Each participant must argue why their contributions or their company's innovations are the most impactful.

DISCOVERIES AND BREAKTHROUGHS

The discoverer of something is the person who finds it or becomes aware of it for the first time by discovering it or by making a discovery.

A discovery may be described as a **breakthrough.** People may say that it is **ground-breaking** or that it breaks new ground. Scientists who are the first to do work in a principal area are **pioneers**. They are said to pioneer particular developments or do pioneering work in a particular area.

REASONING

If you **deduce or infer** something, you can come to the conclusion that it is true. Deduction or inference can refer to a conclusion and to the process of reaching it.
Reasoning like this is deductive in its logic and may be described as logical.

PRESENTING FINDINGS

Scientists usually publish their results or findings in **articles** or papers in scientific journals. Articles and papers are submitted to journals for assessment before publication.

Scientists may give presentations of their work at conferences or congresses: gatherings of scientists who meet to discuss their work. These and other types of scientific gatherings are referred to as meetings.

If someone delivers, gives or presents a paper at a meeting such as this, they **make an oral presentation.**

A scientist presents findings to a conference on something, delivers a paper at a meeting, or gives a paper on something at an international congress.

(from *Key Words in Science and Technology* by B. Mascull)

Task 5. Here is an extract from the article about J. J. Thomson's discovery of the electron. Before reading the text decide which words in the box below you will most probably come across.

conference	**tube**	**experiment**	**theory**
breakthrough	**model**	**science**	**meeting**
paper	**laboratory**	**discovery**	**technology**
formula	**data,**	**research**	**publish**

Now look through the text and notice the use of the words of GSL. Did you guess correctly? Translate the text. Use a dictionary if necessary.

The electron — or at least our recognition of its existence as an elementary particle — passes the century mark this spring.

On April 30. 1897, Joseph Thomson reported the results of his recent experiments on cathode rays to a Friday evening meeting cathode of the Royal Institution, suggesting these royal rays were composed of negatively charged pieces of atoms that he dubbed "corpuscles".

Six months later he published an extensive account of these experiments in the Philosophical Magazine. One of the classic papers of modern physics, it opened the doors of human consciousness to a radically new and often baffling world within atoms.

Together with the discovery of X-rays and radioactivity during the preceding two years, and the introduction of the quantum three years later, this breakthrough led to a revolutionary conception of matter that has since had major impacts on other sciences, on modern technology and art, and even on the way we talk and think.

(from Beam Line, 1997)

Task 6. Fill in the gaps with appropriate prepositions. Choose five word combinations and use them in the sentences of your own.

to give a presentation ... the work ... a conference;
to come ... a conclusion;
to present findings ... a conference ... these phenomena;
to obtain knowledge ... nature;
to work ... a particular area ... technology;
to refer ... the published results ... the research;

the validity ... experimental results;
a series ... equations.

to submit an article ... a journal ... assessment ... publication;
to deliver a paper ... a meeting;
to give a paper ... the recent developments ... this area;
to do research ... plasma;
to happen ... particular conditions;
scientific knowledge applied ... practical purposes;
to work ... theories;

Task 7. Give the English equivalents for the following word combinations.

наукові знання, що застосовуються в практичних цілях;	вперше виконувати роботу у певній галузі;
проводити дослідження у певній галузі;	конструювати нові машини;
проводити експерименти на зразках;	отримувати інформацію;
збирати та обробляти дані;	дійти висновку;
перевірити гіпотезу;	вирішувати завдання;
робити відкриття;	публікувати результати у статтях;
подати статтю до журналу для опублікування;	робити доповідь на конгресі.

Task 8. Answer the following questions making proper use of General Scientific Lexis.

1. How would you define science?
2. What do technologists concern themselves with?
3. What do we call a prototype?
4. Who are innovators?
5. What does inventiveness imply?
6. Why are experiments carried out?
7. What do scientists do with data?
8. What does the word empirical mean?
9. How would you explain the word breakthrough?
10. What scientists are called pioneers?

Task 9. Study some typical collocations. Use the collocations in your own examples.

To do research, a study, science.

To make an experiment, a contribution, an attempt, a discovery, an investigation, a measurement, an observation, a report, an analysis.

To carry out an experiment, an analysis, a reform, a study, a task, an investigation, an operation.

To undertake a project, study, task, measures, activities, initiatives.

REVIEW OF TENSES: ACTIVE FORMS

Check whether you know the basic forms of the English verb.

	Infinitive	*Past Simple*	*Past Participle*	*Present Participle*
Regular verbs	to study to work to act	studied worked acted	studied worked acted	studying working acting
Irregular verbs	to do to make to come to have to write	did made came had wrote	done made come had written	doing making coming having writing

Study the tense table for the verb "write" in the active.

Tenses	*Present*	*Past*	*Future*
Simple (Indefinite)	write / writes	wrote	will write
Continuous (Progressive)	am/is/are writing	was/were writing	will be writing
Perfect	have/has written	had written	will have written
Perfect Continuous (Progressive)	have / has been writing	had been writing	will have been writing

Task 10. Can you answer the following grammar questions? What tense is used?

1. if the time when the action happened is not important?
2. if the time of the action is important?
3. to express an activity in progress at a time in the past?
4. to express an action that happened before a definite time in the past?
5. to tell a story in a chronological order?
6. to express a completed action at a definite time in the past or past habits?
7. to express a past experience the time of which is not specified?
8. to express the present result of a past event?
9. to express an activity in the near future or a planned future arrangement?
10. to describe an activity happening now, around now, and temporary/ activities?
11. to describe things that are always true. or true for a long time?
12. to express a future decision or intention made at the moment of speaking?
13. to express a future fact?
14. to express a present habit?
15. to express an action or state which began in the past and still continues?
16. to express an action which began before the time of speaking in the past, continued up to that time, or stopped just before it?

Task 11. Look at the verbs in italics in the sentences below. Comment on the use of grammar tenses.

1. He ***made*** a report on research in progress two weeks ago.
2. They ***will discuss*** the results of the experiment at the next seminar.
3. This hook ***provides*** useful information.
4. We ***have*** recently ***resolved*** some of our difficulties.
5. We ***are taking*** our examination in physics next month.
6. We ***have been solving*** the problem for the last two hours.
7. They ***had been waiting*** for a few hours before they could resume the experiment.
8. The work ***will give*** valuable results.
9. Study of these properties ***is going*** on a large scale.
10. Prof. Brown ***was working*** at our laboratory last year.
11. They ***have worked*** in this field for a long time.
12. We ***are working*** on an interesting project now.
13. They ***had found*** a solution to the problem by the time we arrived.
14. He ***has been*** a lecturer for 10 years.

UNIT 3.
AUTOMATION TECHNOLOGY

"Automation does not need to be our enemy. I think machines can make life easier for men, if men do not let the machines dominate them."
John F. Kennedy

Task 1. Read the text, write down unknown words and learn them.

Automation is the application of machines to tasks performed by human beings.

The term "mechanization" is often used to refer to the simple replacement of human labour by machine, automation generally implies the integration of machines into a self-governing system.

The term "automation" appeared in the automobile industry about 1946. It was used to describe the increased application of automatic devices and controls in mechanized production lines. The origin of the word is attributed to D.S. Harder, an engineering manager at the Ford Motor Company at the time. The term is used not only in a manufacturing context, but also outside it where there is a replacement of mechanical, electrical, or computerized action.

In general usage, *automation can be defined as a technology concerned with performing a process by means of programmed commands combined with automatic feedback control to ensure execution of the instructions.* The automated system is capable of operating without human intervention. The development of this technology has become increasingly dependent on the use of computers and computer-related technologies. Automated systems have become increasingly sophisticated and complex.

The most typical humanlike characteristic of a modern industrial robot is its powered mechanical arm. The robot's arm can be programmed to move through a sequence of motions to perform useful tasks, such as loading and unloading parts at a production machine or making a sequence of spot-welds on the sheet-metal parts of an automobile body during assembly. Industrial robots are typically used to replace human workers in factory operations.

(Adapted from Encyclopedia Britannica)

Task 2. Scan the text and find word combinations with the following meanings:

Праця людини	автоматичні засоби управління
виконання команд	послідовні рухи
механізовані потокові лінії	вдосконалені системи
автоматизована техніка	виконувати корисні завдання
корпус автомобіля	означати/мати на увазі
зворотній зв'язок	без втручання людини

Task 3. Give Ukrainian equivalents.

To accomplish the activities	powered mechanical arm
humanlike characteristics	industrial robot
production line	feedback control
human intervention	production machine

spot welding	sheet metal
engineering manager	computerized action
human effort	programmed command
computer-related technologies	human intervention

Task 4. Choose some English equivalents for every Ukrainian word.

	man
	ability
	to operate
	person
виробляти	to produce
	to function
людина	to work
	capability
працювати (функціонувати)	to fabricate
	capacity
здатність	to generate
	to act
	human being
	to manufacture

Task 5. Find synonyms for the underlined words. There is one extra word.

field	***complex***	***progressive***	***humanlike***
instruments	***engines***	***manufacturing***	***operating***
instructions	***unification***		

1. Automation implies the integration of machines into a self-governing system.
2. Automatic devices and controls are used in mechanized production lines.
3. Automation can be defined as a technology concerned with performing a process by means of programmed commands.
4. Robotics is a specialized branch of automation in which the automated machines possess anthropomorphic characteristics.
5. At present advanced automated systems have become highly sophisticated.

Task 6. Answer the following questions.

1. What is automation technology?
2. When did the term “automation” appear?
3. What are the properties of the automated system?
4. What is the role of industrial robots in modern society?
5. Name the industries that have been affected by automation. Explain your choice.
6. Surf the net and find information about D.S. Harder, an engineering manager at the Ford Motor Company. Be ready to present it in the classroom.

Task 7. Translate sentences into English. Don’t forget that one term may have several different meanings.

1. Термін «автоматизація» з'явився в 1946 році в автомобільній промисловості. Строк обслуговування будь-якої машини обмежений.

2. Автоматизовані технології пов’язані з використанням комп’ютерів. Технологія збирання автоматизованих систем стає все більш досконалою.

3. Усі автоматичні виробничі процеси виконуються за допомогою запрограмованих команд. Спеціальний комп'ютер обробляє дані автоматичного зворотного зв'язку без участі людини.

4. Робототехніка включає технології, де всі запрограмовані команди виконуються роботами. Щоб контролювати будь-яке нове обладнання, необхідно прочитати інструкції.

5. Кожна автоматизована система здатна працювати/функціонувати на базі комп'ютерних технологій. Управління небезпечними виробничими процесами є функцією промислових роботів.

6. В епоху автоматизації сила людських рук була замінена механічною силою. Механічні важелі роботів можуть бути запрограмовані на виконання багатьох важких операцій на заводі.

7. Робототехніку можна вважати частиною автоматизованих технологій. Операції завантаження та розвантаження деталей у складальному цеху виконує промисловий робот.

8. Виробництво роботів із людськими характеристиками є спеціалізованою галуззю автоматизації. Автокомплектуючі – це продукція місцевого автомобілебудівного заводу.

Task 8. Study the suggested collocations and write your own examples.

A collocation is a group of two or more words that are almost always put together to create a specific meaning.

automation system	Low-cost automation also involves the implementation of an **automation system**.
increasing automation	I want more information about the **increasing automation** and the use of high-speed electronic computers for forecasting the weather.
level of automation	The whole process has a high **level of automation**, from the cloning of the vectors and colony selection to the bases called.
automation equipment	Nippon is Japan's largest manufacturer of integrated circuits and office **automation equipment**.
full automation	The 2000-series cameras had been intended to provide **full** exposure **automation**.

Task 9. Study the explanations of the idiom, translate the examples and make your own sentences.

be on automatic pilot = *to function or do something automatically, without thinking about one's actions, generally because one has done something many times in the past. Also used in the shortened form, "be on autopilot."*

1. By the second week of data entry, I felt like I was on automatic pilot.

2. Sometimes I arrive at work without remembering how I got there, like I was on automatic pilot the whole time.

GRAMMAR REVISION:

FUTURE FORMS – EXPRESSING FUTURE TIME

FUTURE ARRANGEMENTS

Present continuous (to talk about future events that are already planned and decided, when a date and/or a place have been chosen).	***I'm seeing the product manager at 6.*** ***We are getting married next week.*** ***I'm flying to New York tomorrow morning.***
Be going to	***I'm going to play tennis with Elisabeth today.***
We can normally use both *present continuous* and *going to* to talk about future plans.	BUT!!!
Present continuous vs be going to	***The present continuous*** emphasises the fact that we have already decided a place and/or time. ***Be going to*** emphasises our intention to do something. ***I'm going to have a drink after work.* (=it's my intention)** ***I'm having a drink with some colleagues after work.* (=it has been arranged)**
Future continuous instead of the present continuous for future events that have already been planned or decided.	***We'll be coming next weekend.*** ***We'll be leaving at 8 a.m. tomorrow.***
We often use the future continuous to ask politely about future arrangements.	***Will you be going home this summer?***
We use the future continuous to talk about situations or actions that will be in progress at a certain time in the future.	***This time next week, we'll be travelling to Paris.*** ***Tomorrow at 10, you'll be doing your exam.***
Present simple (for future events that are scheduled or timetabled).	***The train leaves at 4.*** ***Shops close at 6.***

	I have my yoga class tomorrow at 10.
PREDICTIONS	
Will (to talk about something we think will happen)	***I think he'll win the election.*** ***He will be a good doctor.***
Be going to (to talk about something that is very near to happen or that we see is going to happen (there is present evidence)	***Don't drive like a crazy man. We're going to have an accident!*** ***The doctor said I'm going to have a girl.***
FUTURE PERFECT	
Future perfect simple (for actions that will be finished before a certain time in the future).	***By 2050, researchers will have found a cure for cancer.*** ***By this time next year, I'll have graduated.***
Future perfect simple (to talk about the duration of a situation until a certain time in the future (with stative verbs).	***By the time I leave, I will have been in England for 6 months.*** ***In 2 years, we will have been married for 20 years.***
FUTURE PERFECT CONTINUOUS	
Future perfect continuous (with dynamic verbs to talk about the duration of a situation until a certain time in the future).	***By the end of the year, she will have been working on the publication for over ten years.*** ***When he steps into the boxing ring on Saturday he will have been training for about 18 months.***
FUTURE TIME CLAUSES (WHEN, AS SOON AS, UNTIL, BEFORE, AFTER)	
Use present simple to talk about the future in sentences with when, as soon as, until, before, after	***I'll retire when I'm 70.*** **(NOT: ~~when I'll be)~~** ***I won't call you until I arrive.*** **(NOT: I ~~will arrive~~.)**
OTHER USES OF WILL	
Instant decisions (for decisions that we make at the moment of speaking).	***'Oh, we don't have sugar.' 'Don't worry, I'll buy some.'***
Promises and refusals	***I will help you whenever you need me.*** ***I won't lend him my car.***
Future facts	***The president will visit the Vatican next November.***

Offers (When we offer to do something for somebody, we use I will in statements or shall I in questions).	***I'll carry that bag for you.***
	Shall I organise the meeting?
Suggestions (We use shall we to make suggestions).	
Requests	***Shall we eat out today?***
	Will you open the door, please?

Task 10. Using "will" for Predictions, complete the suggested.

Example: ***The new automation system _____ (increase) …….***

The new automation system will increase productivity by 20%.

1. I _____ (attend) ……..
2. Experts believe that robots _____ (replace) ……..
3. The company _____ (launch) its ……...
4. By 2028, smart homes _____ (become) …….
5. I _____ (buy) a new domotics system …….
6. I hope the exhibition _____ (showcase) ……..
7. He _____ (present) his research on …… at the technical exhibition.
8. We _____ (see) more …… on the roads soon.
9. In the next decade, most households _____ (have) some form of …….

Task 11. Using "going to" for Plans and Intentions, complete the sentences with the correct form of "going to."

1. I _____ (install) a new home automation system next month.
2. The pupils of the lyceum _____ (visit) the robotics lab tomorrow.
3. She _____ (demonstrate) the latest robot prototype at the exhibition?
4. We _____ (upgrade) our security system with new AI features.
5. The engineers _____ (not / develop) a new AI algorithm for the project.
6. He _____ (attend) the international domotics conference in Paris?
7. The company _____ (release) a new line of smart home devices.
8. I _____ (explore) the latest trends in automation technologies.
9. They _____ (implement) a new system for automated customer service.
10. She _____ (not / write) a paper on the future of robotic automation.

Task 12. Choose the correct form to complete the sentences.

1. I think automation technologies _____ (will/going to) revolutionize the industry.
2. We _____ (will/going to) upgrade our system next month.
3. Look at those clouds! It _____ (will/going to) rain soon.
4. The company _____ (will/going to) introduce a new robot prototype next year.
5. She _____ (will/going to) attend the AI seminar next week.
6. They _____ (will/going to) improve the home automation interface.
7. I _____ (will/going to) study robotics engineering in college.
8. He _____ (will/going to) present his paper on machine learning tomorrow.
9. The new domotics device _____ (will/going to) make our lives easier.
10. I _____ (will/going to) visit the technical exhibition this weekend.

Task 13. Complete the sentences using "will," "going to," or the present continuous.

1. I _____ (visit) the smart home exhibition tomorrow.
2. The engineers _____ (develop) a new AI system next year.
3. We _____ (test) the new automation software this afternoon.
4. She _____ (give) a presentation on robotics at the conference.
5. The new device _____ (will/make) home automation more accessible.
6. They _____ (plan) to attend the technical seminar next week.
7. I _____ (write) a report on the latest automation technologies.
8. He _____ (launch) the new product line next month.
9. The company _____ (upgrade) the existing system to include AI features.
10. We _____ (predict) that robots _____ (will/replace) many manual jobs in the near future.

Task 14. Complete the sentences with the correct form of the verbs in parentheses, using either the Future Perfect or the Future Perfect Continuous.

1. By the end of this year, the team _____ (develop) a new AI algorithm for the project.
2. By next month, she _____ (work) on the home automation system for two years.
3. In five years, most households _____ (implement) advanced domotics technologies.
4. By the time the exhibition starts, the company _____ (test) the new robotic prototypes for several weeks.
5. They _____ (complete) the installation of the new automation software by the end of the day.
6. By 2025, engineers _____ (design) more efficient robots to assist in household tasks.
7. When the technical exhibition opens, we _____ (prepare) our presentations for three months.
8. By the end of the conference, the researchers _____ (present) all their findings on machine learning.
9. In a few years, we _____ (use) AI to improve customer service for a decade.
10. By tomorrow morning, he _____ (finish) programming the new software feature.

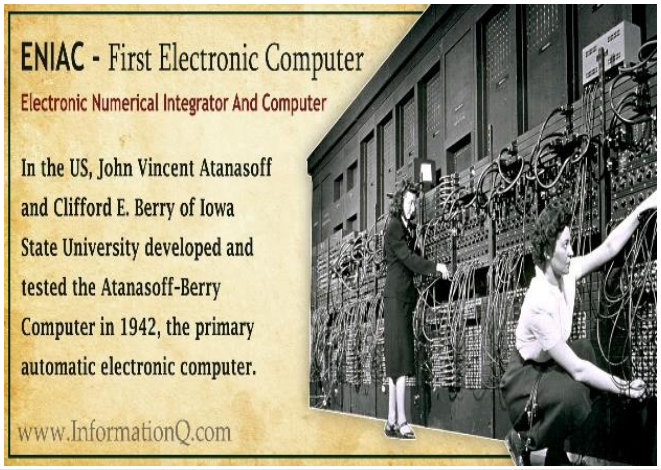
Task 15. Complete the sentences using the correct tense form of the verb.

1. The robot will start cleaning the house when you _____ (give) the command through the app.
2. As soon as the AI system _____ identifies a potential threat, it _____ (alert) the security team immediately.
3. The new domotics system won't be activated until all sensors _____ (install).
4. When the programming team _____ (complete) the software update, we will test the new features.
5. As soon as a specialist _____(finish) configuring the home automation settings, he _____ (demonstrate) its capabilities.
7. The system will reboot when it _____ (finish) installing the new software patch.
8. After the developers have fixed the bugs, the software _____ (release) to the public.
9. The smart assistant will provide recommendations _____ it gathers enough user data.
10. The company _____ (announce) the new product line after the technical exhibition _____ (end).

UNIT 4
MODERN DEVELOPMENTS IN AUTOMATION TECHNOLOGY

The 20th century was marked by a number of significant developments in various fields: the digital computer, improvements in data-storage technology and software to write computer programs, advances in sensor technology. All these developments have contributed to progress in automation technology.

Development of the electronic digital computer called ENIAC (Electronic Numerical Integrator and Computer) in 1946 and UNIVAC I (Universal Automatic Computer) in 1951 permitted the control function in automation to become much more sophisticated and the associated calculations to be executed much faster than before.



Miniaturization in computer technology contributed to the appearance of smaller and less expensive machines capable of performing calculations much quicker.

Simultaneous improvements have been made in the methods of programming computers. Modern programming languages are easier to use and they are characterized by more powerful data-processing and logic capabilities.

Advances in sensor technology have provided a great variety of measuring devices that can be used as components in automatic feedback control systems.

Artificial intelligence is an advanced field of computer science in which the computer is programmed to exhibit characteristics commonly associated with human intelligence. These characteristics include the ability to learn, understand language, make reasoning, solve problems, and similar mental capabilities. It is expected that developments in artificial intelligence will provide robots and other "intelligent" machines with the ability to communicate with humans and to accept very high-level instructions.

(Adapted from Encyclopedia Britannica)

Task 1. Choose some English equivalents for every Ukrainian word.

механізм	1. device
управління	2. control
деталь	3. part
	4. mechanism
	5. management
	6. machine
	7. component
	8. manipulation
	9. machinery
	10. element
	11. direction
	12. item

Task 2. Give equivalents for the following word combinations.

Significant developments; характеристики, які асоціюються з людським інтелектом; capacity for learning, система автоматичного керування зі зворотним зв'язком; ability to

communicate; досягнення сенсорних технологій; powerful data-processing capabilities; штучний інтелект.

Task 3. Put these words into the spaces in the paragraph below.

sources ***converted*** ***versatile***
requires ***stored***

1. An automated system is designed to accomplish some useful action, and that action ……. power.
2. There are many …… of power available, but the most commonly used power in today's automated systems is electricity.
3. Electrical power is the most ……., because it can be readily generated from other sources (e.g., fossil fuel, hydroelectric, solar, and nuclear)
4. It can be ……. into other types of power (e.g., mechanical, hydraulic) to perform useful work.
5. In addition, electrical energy can be …… in high-performance, long-life batteries.

Task 4. Answer the following questions.

1. What modern programming languages do you know?
2. What is a Feedback Control System? What components does this system consist of?
3. What advantages of Feedback Control System can you name?

Task 5. Translate into English using the active vocabulary of the unit.

1. Штучний інтелект може змінити наше життя, зробити його ефективнішим та легшим.
2. Штучний інтелект присутній в сфері медицини. Він представлений потужними діагностичними алгоритмами та точними хірургічними роботами.
3. Ви вже користуєтесь цими останніми розробками галузі?
4. Завдяки сучасним технологіям виконувати розрахунки стало набагато легше та швидше.
5. Сенсорні технології оточують нас в повсякденному житті. Більшість громадських закладів (вокзали, кафе, бібліотеки) використовують багатосенсорні дисплеї, щоб зменшити контакт працівників з відвідувачами.
6. Коронавірус впливає на розумові здібності людей.
7. Контрольно-вимірювальні прилади забезпечують контроль за роботою двигуна автомобіля та всіх його систем.

Language Work:

Revision: Past Simple and Present Perfect

We use the Present perfect to describe past actions with present relevance.

We use the Past simple to describe completed actions in the past. It is often used with time expressions such as *last year, before PCs were introduced, in 1998.* Note these examples:

I bought a new computer *last week.*
We tried it out *last term.*
I've scanned in about a third of these photographs.

Task 6. Put the tenses in this dialogue in the correct form: Past simple or Present perfect.

➢ What ---------- (do) today? - I ---------- (work) on my project. I --------- (search) the Web for sites on digital cameras.

- ---------- (find) any good ones? - I -------- (find) several company sites - Sony, Canon, ... but I ----------(want) one which ---------- (compare) all the models.
- Which search engine ---------- (use)?
- Dogpile mostly, ---------- (ever use) it?
- Yes, I ---------- (try) it but I ---------- (have) more luck with Ask Jeeves. Why don't you try it?
- I ---------- (have) enough for one night. I ---------- (spend) hours on that project.
- I ---------- (not start) on mine yet.
- Yeh? I bet you ---------- (do) it all.

Problem Solving	**How do you think these professions might use computers? Compare answers with others in your group.** architects farmers musicians sales people interior designers landscape gardeners rally drivers

Speaking	**Work in pairs. Find out this information from your partner.** Make sure you use the correct tense in your questions. For example: *download music from the Internet - [what site]* **Have you ever downloaded music from the Internet?** **What site did you use?**

1. send a video email attachment [who to, when]
2. replace a hard disk [what model]
3. fix a printer fault [what kind]
4. make your own website [how]
5. have a virus [which virus]
6. write a program [which language]

Speaking	**Describe how you use computers in your study and in your free time.** 

UNIT 5
THE PRINCIPLE OF FEEDBACK CONTROL

1	**actuate** *(v)*	активізувати; приводити в дію
2	**actuator** (actuating device)	привід; виконавчий механізм
3	**chain drive**	ланцюговий привід; ланцюгова передача
4	**design** *(v)*	конструювати; проектувати
5	**gear**	шестерня; привід
6	**input**	вхідний сигнал; пристрій введення
	output	вихідний сигнал; пристрій виведення
7	**monitor** *(v)*	контролювати; керувати; регулювати
8	**closed loop**	замкнутий ланцюг, система, петля;
	closed loop control system	замкнута система управління, система управління
	open loop	із зворотним зв'язком;
		розімкнута система, петля, ланцюг
9	**piston**	поршень
10	**power screw**	гвинт для передачі зусилля
11	**reference value**	задане значення
12	**set point**	задане значення; встановлена точка
13	**value**	значення, величина
14	**valve**	клапан
15	**variable**	змінна (величина)

Task 1. Match the words with close meaning.

a) 1. to contain	a. to desire
2. to use	b. to possess
3. to require	c. to connect
4. to have	d. to consist
5. to switch on	e. to apply
6. to control	f. to monitor
7. to join	g. to turn on
b) 1. up-to-date	a. component
2. part	b. motor
3. instrument	c. device
4. production	d. modern
5. various	e. energy
6. engine	f. different
7. power	g. drive
8. actuator	h. manufacturing

FEEDBACK CONTROLS

Feedback controls are widely used in modern automated systems. A feedback control system is composed of five basic components: (1) input, (2) process being controlled, (3) output, (4) sensing elements, and (5) controller and actuating devices. The term "closed-loop feedback control" is often used to describe this kind of system.

The input to the system is the reference value, or set point, for the system output. This represents the desired operating value of the output.

The process being controlled is the heater. In other feedback systems the process might be a manufacturing operation, the rocket engines on a space shuttle, the automobile engine in cruise control, or any of a variety of other processes to which power is applied.

The output is the variable of the process that is being measured and compared to the input.

The sensing elements are the measuring devices used in the feedback loop to monitor the value of the output variable.

The purpose of the controller and actuating devices in the feedback system is to compare the measured output value with the reference input value and to reduce the difference between them. The controller and the actuator of the system are the mechanisms by which changes in the process are accomplished to influence the output variable. These mechanisms are usually designed specifically for the system and consist of devices such as motors, valves, piston cylinders, gears, power screws, chain drives and other mechanical and electrical components.

(Adapted from Encyclopedia Britannica)

Task 2. Choose the best answer.

1. The (*input / output / controller*) to the feedback control system is the reference value.
2. In various processes of feedback systems (*temperature / power / manufacture*) is applied.
3. The sensing elements are the (*processing / actuating / measuring*) devices.
4. Different kinds of sensors in feedback control systems are used for (*illustration / automation / heating*).
5. The controller and actuator of the system are the mechanisms by which (*expansion / changes / setting*) in the process are accomplished.
6. When the room temperature is below the set point, the switch (*controls / turns off / turns on*) the heater.

Task 3. Translate the sentences into English using the words from the text.

1. В автоматизованих системах використовується управління зі зворотним зв'язком.
2. Висновок є змінною величиною процесу, який вимірюється і порівнюється з вводом.
3. Зчитувальні елементи – це вимірювальні прилади, які використовуються у зворотному зв'язку.
4. Різні датчики використовуються в системах управління зі зворотним зв'язком в автоматизації.
5. Коли температура буває нижче або вище встановленої точки, перемикач включає або вимикає нагрівач.

Specialist Reading

Task 4. Read the text and try to find answers to the questions after the text.

Computers Make the World Smaller and Smarter

The ability of tiny computing devices to control complex operations has transformed the way many tasks are performed, ranging from scientific research to producing consumer products. Tiny 'computers on a chip' are used in medical equipment, home appliances, cars and toys. Workers use handheld computing devices to collect data at a customer site, to generate forms, to control io inventory, and to serve as desktop organisers.

Not only is computing equipment getting smaller, it is getting more sophisticated. Computers are part of many machines and devices that once required continual human supervision and control. Today, computers in security systems result in safer environments, computers in cars improve energy

efficiency, and computers in phones provide features such as call forwarding, call monitoring, and call answering.

These smart machines are designed to take over some of the basic tasks previously performed by people; by so doing, they make life a little easier and a little more pleasant.

Smart cards store vital information such as health records, drivers' licenses, bank balances, and so on. Smart phones, cars, and appliances with built in computers can be programmed to better meet individual needs. A smart house has a built-in monitoring system that can turn lights on and off, open and close windows, operate the oven, and more.

With small computing devices available for performing smart tasks like cooking dinner, programming the DVD recorder, and controlling the flow of information in an organization, people are able to spend more time doing what they often do best - being creative. Computers can help people work more creatively.

Multimedia systems are known for their educational and entertainment value, which we call 'edutainment'. Multimedia combines text with sound, video, animation, and graphics, which greatly enhances the interaction between user and machine and can make information more interesting and appealing to people. Expert systems software enables computers to 'think' like experts. Medical diagnosis expert systems, for example, can help doctors pinpoint a patient's illness, suggest further tests, and prescribe appropriate drugs.

Connectivity enables computers and software that might otherwise be incompatible to communicate and to share resources. Now that computers are proliferating in many areas and networks are available for people to access data and communicate with others, personal computers are becoming interpersonal PCs. They have the potential to significantly improve the way we relate to each other. Many people today telecommute - that is, use their computers to stay in touch with the office while they are working at home. With the proper tools, hospital staff can get a diagnosis from a medical expert hundreds or thousands of miles away. Similarly, the disabled can communicate more effectively with others using computers.

Distance learning and videoconferencing are concepts made possible with the use of an electronic classroom or boardroom accessible to people in remote locations. Vast databases of information are currently available to users of the Internet, all of whom can send mail messages to each other. The information superhighway is designed to significantly expand this interactive connectivity so that so people all over the world will have free access to all these resources.

People power is critical to ensuring that hardware, software, and connectivity are effectively integrated in a socially responsible ss way. People - computer users and computer professionals - are the ones who will decide which hardware, software, and networks endure and how great an impact they will have on our lives. Ultimately people power must be exercised to ensure that computers are used not only efficiently but in a socially responsible way.

1. Name some types of devices that use 'computers on a chip'.

2. What uses of handheld computers are mentioned in the text?
3. What are the benefits of using computers with the following items?
a) Security systems b) Cars c) Phones
4. What smart devices are mentioned in the text?
5. What are smart cards used for?
6. What are the advantages of multimedia?
7. What can medical expert systems do?
8. How can computers help the disabled?
9. What types of computing systems are made available to people in remote locations using electronic classrooms or boardrooms?
10. What aspects of computing can people power determine?

Task 5. Match the terms with their definitions.

	a) Software that enables computers to 'think' like experts
	b) Use computers to stay in touch with the office while working at home
1. Edutainment	c) Internet system designed to provide free, interactive access to vast resources for people all over the world
2. Multimedia	d) Multimedia materials with a combination of educational and entertainment content
3. Expert system	e) A combination of text with sound, video, animation, and graphics
4. Telecommute	
5. Information superhighway	

Task 6. Mark the following statements as True or False:

1. Desktop organizers are programs that require desktop computers.
2. Computers are sometimes used to monitor systems that previously needed human supervision.
3. Networking is a way of allowing otherwise incompatible systems to communicate and share resources.
4. The use of computers prevents people from being creative.
5. Computer users do not have much influence over the way that computing develops.
6. Tiny computing devices are only used in scientific research and consumer products.
7. Computing equipment is becoming less sophisticated as it gets smaller.
8. Smart cards can store vital information such as health records and bank balances.
9. Multimedia systems only combine text and graphics to enhance interaction.
10. Telecommuting allows people to stay in touch with the office while working from home.
11. The information superhighway aims to restrict access to global resources.
12. People power is essential for the effective and socially responsible integration of hardware, software, and connectivity.

GRAMMAR REVISION:
OTHER WAYS TO EXPRESS FUTURE

BE ABOUT TO, BE ON THE BRINK/VERGE/POINT OF

Be about to

be about to + infinitive is used to say that something will happen in the very near future.
*Some apps **are about to disappear** from the market.*
*Scientists say they **are about to find** a vaccine.*

Be on the brink/verge/point of

We can also use be **on the brink of**, **be on the verge of** or **be on the point of** to say that something will happen very soon.
*Our country's economy is **on the brink of collapse**.*
*This historical museum is **on the brink of losing** half its masterpieces.*
*They are **on the verge of becoming** the team to win most finals in history.*
*The two historical enemies **are on the point of reaching** an agreement.*

Be due to

We use **be due to + infinitive** to talk about things that are planned or expected to happen.
*Greece **is due to repay** around £6 billion to its creditors next semester.*
*The secretary **is due to arrive** in Montreal tomorrow morning.*

Be to + infinitive is used in different situations.

Official arrangements

Be to + infinitive is often used in news reports to talk about official arrangements and events that are planned or expected to happen.
The meaning is usually something like 'it is expected'.
*Prince William **is to visit** Paris for the first time since his mother died.* (=It is expected that Prince William will…)
*Nine care homes for the elderly **are to close** by the end of March.*

Formal instructions and orders

be to + infinitive is used to talk about **official instructions** and **orders**. When used in the negative form, it expresses **prohibition**.
*All employees **are to attend** a health and safety orientation at the end of the week.*
*You **are not to leave** this room until I say so.*

If clauses	We often use **be to + infinitive** in an **if-clause**. In these cases, we say what should be done (main clause) to achieve the desired result (if-clause). *We need to be open to everybody's opinion if we **are to avoid** repeating the mistakes of the past.* *If he **is to succeed**, he will need to learn to represent the interests of all Americans.*
Be bound to, be likely to (probability)	
Be bound to	We use **be bound to + infinitive** to say that something is certain or very likely to happen. *They **are bound to like** him. He is such a sweet guy.* *His new film **is bound to win the heart** of every romantic out there.*
Be likely to	We use **be likely to + infinitive** to say that something will probably happen. We can also use **It + be likely that + clause**. *The government **is likely to pass** new regulations very soon.* ***It's likely that** the company will have to pay for the damages.* We use **be unlikely + infinitive** to say that something will probably not happen. We can also use **It + be unlikely that + clause**. *He **is unlikely to win** this match.* *It's **unlikely that** the weather will change over the next few days.*

Task 7. Choose the most appropriate future expression for the sentences below.

1. The new AI software _____ to be released next month.
   a. are about
   b. is on the verge
   c. is due
   d. is like

2. The government _____ to pass the new law by the end of the year.
a. is about
b. is on the verge
c. is
d. is on the point

3. The new canal _____ to be finished by December next year.
a. is due
b. is on the brink
c. is about
d. is on the verge

4. Researchers say they are _____ discovering a new form of life.
a. about
b. on the verge of
c. on the point of

d. on the point of / on the verge of

5. The National Institute of Health _____ to begin the first human trials for an experimental vaccine in the coming months.
a. is on the verge
b. is due
c. is about
d. is on the point

6. The prime minister _____ contact the French president to begin negotiations. (news)
a. is on the verge
b. is on the brink
c. is due
d. is to

7. Borneo's orangutans are _____ extinct.
a. on the verge of becoming
b. about to become
c. due to become
d. on the verge of becoming / about to become

Task 8. Choose the most appropriate future expression for the sentences below.

1. The company _____ launch its new AI software next month.
a. is about to
b. is on the verge of
c. is due to
d. is likely to

2. The robotics team _____ demonstrate their latest prototype at the technical exhibition.
a. is about to
b. is on the brink of
c. is due to
d. is bound to

3. The new home automation system _____ revolutionize the way we live.
a. is unlikely to
b. is bound to
c. is to
d. is on the point of

4. The engineers _____ start the programming for the new software tomorrow.
a. are about to
b. are on the verge of
c. are due to
d. are to

5. The new multimedia platform _____ enhance user experience significantly.
a. is about to
b. is likely to
c. is due to

d. is on the point of

6. The company _____ announce a breakthrough in domotics technology soon.
a. is on the verge of
b. is unlikely to
c. is about to
d. is to

7. The latest version of the programming language _____ be easier to learn.
a. is on the point of
b. is likely to
c. is due to
d. is about to

8. The technical team _____ fix the software bugs before the launch.
a. is bound to
b. is about to
c. is due to
d. is on the verge of

9. The developers _____ start the beta testing phase next week.
a. are to
b. are bound to
c. are unlikely to
d. are about to

10. The new computer model _____ sell out quickly due to high demand.
a. is about to
b. is unlikely to
c. is bound to
d. is on the point of

Task 9. Complete the story using the appropriate future expressions. Choose from the options provided (about to, on the brink of, on the verge of, on the point of, due to, to + INFINITIVE, bound to, likely to, unlikely to).

The annual International Robotics Exhibition was approaching, and the excitement in the tech community was palpable.

1. The event organizers were _____ announce the keynote speaker for the event any moment now.
2. The latest innovations in home automation systems were _____ be showcased at the event.
3. Dr. Samantha Lee, a renowned AI expert, was _____ present her groundbreaking research on machine learning.
4. Attendees were _____ witness the debut of a new humanoid robot that was said to mimic human emotions.
5. The new AI-driven security system was _____ revolutionize the industry, offering unparalleled protection and convenience.

6. Tech enthusiasts knew that the exhibition was _____ unveil something truly spectacular, given the buzz surrounding it.
7. Programmers from all over the world were _____ attend workshops on the latest programming languages.
8. The CEO of a leading tech company was _____ reveal a new multimedia platform that was expected to change how we consume digital content.
9. As the day of the exhibition drew near, the tech community was _____ excitement and anticipation.
10. Given the level of innovation expected, the event was _____ attract a record number of visitors this year.

Task 10. Translate into English using the appropriate future expression: about to, on the brink of, on the verge of, on the point of, due to, to + Infinitive, bound to, likely to, unlikely to.

1. Нова система домашньої автоматизації, керована штучним інтелектом, незабаром вийде на ринок. Ця система обіцяє безпрецедентну зручність та ефективність.
2. Команда розробників знаходиться на етапі завершення останнього оновлення операційної системи робота.
3. Очікується, що наступна версія мультимедійного програмного забезпечення буде випущена до кінця місяця.
4. Наступного тижня інженери представлять свої інноваційні рішення для смарт будинків на міжнародній виставці технологій.
5. Завдяки інтеграції передового штучного інтелекту нова система безпеки підвищить загальну безпеку в розумних будинках.
6. Оновлена комп'ютерна модель ймовірно домінуватиме на ринку завдяки своїм передовим функціям.
7. Незважаючи на перспективний прототип, нова модель робота навряд чи буде готова до виробництва в цьому році.
8. Дослідницька група опублікує свої висновки з машинного навчання в провідному технічному журналі.
9. Стартап отримає значні інвестиції для розширення своїх інноваційних технологій автоматизації.

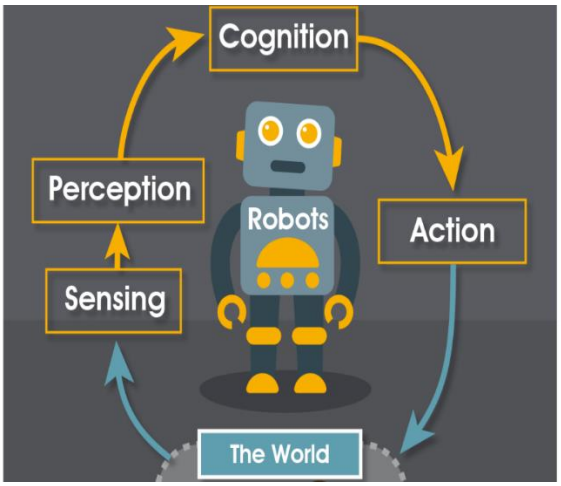
UNIT 6
MACHINE PROGRAMMING

Pre-reading activity. Match the words with close meaning.

a) 1. to accomplish	a. to operate
2. to respond	b. to react
3. to function	c. to complete
4. to vary	d. to change
5. to convert	e. to transform

b) 1. instruction	a. command
2. component	b. capacity
3. capability	c. circumstances
4. complex	d. part
5. conditions	e. monitoring
6. control	f. work
7. loop	g. circuit
8. fashion	h. storage
9. memory	i. style
10. operation	j. sophisticated

The programmed instructions determine the set of actions that is to be accomplished automatically by the system. The program specifies what the automated system should do and how its various components must function in order to accomplish the desired result. The content of the program varies considerably from one system to the next. Relatively simple systems have the program consisting of a limited number of well-defined actions. These actions are performed continuously and repeatedly in the proper sequence with no deviation from one cycle to the next. In more complex systems the number of commands could be quite large. The level of detail in each command could be significantly greater. In relatively sophisticated systems the sequence of actions can be altered in response to variations in raw materials or other operating conditions.



Some of the programmed commands may be executed in a simple open-loop fashion—i.e., without the need for a feedback loop to verify that the command has been properly carried out. For example, a command to flip an electrical switch may not require feedback. The need for feedback control in an automated system might arise when there are variations in the raw materials being fed into a production process, and the system must take these variations into consideration by making adjustments in its controlled actions. Without feedback, the system would be unable to exert sufficient control over the quality of the process output.

Mechanical devices, punched paper tapes, magnetic tapes, magnetic disks, computer memory, or any other media that have been developed over the years may contain the programmed commands. Nowadays automated equipment uses computer storage technology as the means for storing the programmed commands and converting them into controlled actions. One of the advantages of computer storage is that the program can be readily changed or improved.

Programmable machines are often capable of making decisions during their operation. The decision-making capacity is contained in the control program in the form of logical instructions. The several reasons for providing an automated system with decision-making capability are the following:

1) error detection and recovery; 2) safety monitoring;

3) interaction with humans; 4) process optimization.

(Adapted from Encyclopedia Britannica)

Task 1. Match the words on the left with their meanings on the right.

1. programmed	a. Affect or apply force or pressure.
2. accomplish	b. The way things are arranged in a specific order.
3. components	c. Highly advanced or complex.
4. sequence	d. Information about how something is performing, used for making improvements.
5. deviation	e. Execute or carry out a task.
6. sophisticated	f. A set of programmed instructions.
7. feedback	g. Parts or elements that make up a whole.
8. exert	h. A departure from the expected or standard.
9. quality	i. The standard of something as measured against other things.
10. automated	j. Operating with little or no human intervention.

Task 2. Fill in the blanks with the appropriate words from the text.

1. The _____ instructions determine the set of actions.
2. The program specifies what the automated system should do and how its various _____ must function.
3. In more complex systems, the number of commands could be quite large, and the level of detail in each command could be significantly _____.
4. Programmable machines can make decisions during their operation through logical _____.
5. Computer storage technology is commonly used for storing the programmed _____ and making changes.
6. Safety monitoring is one reason for providing an automated system with decision-making _____.

Task 3. Write sentences using the following words from the text: "automated," "exert," "sequence," and "sophisticated."

1. The _____ assembly line efficiently produces cars with minimal human involvement.
2. It takes a high level of skill to operate such a _____ piece of machinery.
3. The _____ of events in the software code needed adjustment.
4. Robots can _____ great force when necessary.

Task 4. Give English / Ukrainian equivalents.

1. programmed commands	6. в належній послідовності
2. виконуватися автоматично	7. to be unable to exert sufficient control
3. properly carried out	8. контроль за якістю виходу процесу
4. значно змінюватися	9. raw materials
5. to make adjustments	10. простий відкритий спосіб.

Task 5. Read the abstract and choose the appropriate word.

1. Programmable machines are often ***capacity – capable - comparability*** of making decisions during their operation.

2. The decision-making capacity ***is containing - is being containing - is contained*** in the control program in the form of logical instructions that govern the operation of such a system under varying circumstances.

3. Under one set of circumstances, the system ***responds - rejects - reimburses*** one way. Under different circumstances, it responds in another way.

4. There are several reasons for providing an automated system ***for - with - on*** decision-making capability, including (1) error detection and recovery, (2) safety monitoring, (3) interaction with humans, and (4) process optimization.

5. Automated systems ***usually require - are usually required - requiring*** to interact with humans in some way.

6. An automatic bank teller machine, for example, must ***to receive - received - receive*** instructions from customers and act accordingly.

7. A variety of different instructions from humans is possible in some automated systems. And the decision-making capability of the system must be ***quit – quiet - quite*** sophisticated in order to deal with the array of possibilities.

Task 6. Answer the questions.

1. Why do we need the machine programming?
2. What are programmed instructions?
3. What is the number of actions in a simple program?
4. What does the sophisticated system program provide for?
5. What programmed commands do not need a feedback loop?
6. What are the requirements for the automated system to function properly and accomplish the desired result?
7. What does the content of the program depend on?
8. Where can you find programmed commands?
9. What capability do programmable machines possess?

Discussion Questions:

1. Why is feedback important in automated systems, and what are some situations where it's necessary?
2. How has computer storage technology impacted the field of machine programming?
3. Can you think of real-world examples where automated machines make decisions during their operation?
4. What are some examples of media used to store programmed commands in automated systems, and what advantages does computer storage technology offer?
5. How do automated systems interact with humans, and why is this interaction facilitated by decision-making capabilities?

Specialist Reading

Task 7. Read the text and decide whether the statements after the text are True or False.

Introduction to Software

For as long as there has been computer hardware, there has also been computer software. But what is software? Software is just instructions written by a programmer which tells the computer what to do. Programmers are also known as 'software developers', or just plain 'developers'.

Nothing much is simple about software. Software programs can have millions of lines of code. If one line doesn't work, the whole program could break! Even the process of starting software goes by many different names in English. Perhaps the most correct technical term is “execute”. Be careful, because the term “execute” also means (in another context) to put someone to death! Some other common verbs used to start a software program you will hear are 'run', 'launch, and even 'boot' (when the software in question is an operating system).

Software normally has both features and bugs. Hopefully more of the former than the latter! When software has a bug there are a few things that can happen. The program can crash and terminate with a confusing message. This is not good. End users do not like confusing error messages such as:

Site error: the file /home7/businfc6/public_html/blog/wordpress/wp-content/plugins/seo-blog/core.php requires the ionCube PHP Loader ioncube_loader_lin_5.2.so to be installed by the site administrator.

Sometimes when software stops responding you are forced to manually abort the program yourself by pressing some strange combination of keys such as ctrl-alt-delete.

Because of poor usability, documentation, and strange error messages, programming still seems very mysterious to most people. That's too bad, because it can be quite fun and rewarding to write software. To succeed, you just have to take everything in small steps, think very hard, and never give up.

I think everyone studying Information Technology should learn at least one programming language and write at least one program. Why? Programming forces you to think like a computer. This can be very rewarding when dealing with a wide range of IT-related issues from tech support to setting up PPC (pay-per-click) advertising campaigns for a client's web site. Also, as an IT professional, you will be dealing with programmers on a daily basis. Having some understanding of the work they do will help you get along with them better.

Software programs are normally written and compiled for certain hardware platforms. It is very important that the software is compatible with all the components of the computer. For instance, you cannot run software written for a Windows computer on a Macintosh computer or a Linux computer. Actually, you can, but you need to have special emulation software or a virtual machine installed. Even with this special software installed, it is still normally best to run a program on the kind of computer for which it was intended.

There are two basic kinds of software you need to learn about as an IT professional. The first is closed source or proprietary software, which you are not free to modify and improve. An example of this kind of software is Microsoft Windows or Adobe Photoshop. This software model is so popular that some people believe it's the only model there is. But there's a whole other world of software out there.

The other kind of software is called open-source software, which is normally free to use and modify (with some restrictions of course). Examples of this type of software include most popular programming languages, operating systems such as Linux, and thousands of applications such as Mozilla Firefox and Open Office.

1. For as long as there has been computer hardware, there has also been computer software.	True	False
2. Software is just instructions written by a programmer which tells the computer what to do.	True	False
3. Programmers are also known as “developers”.	True	False
4. Software programs can have millions of lines of code.	True	False
5. If one line doesn't work, the whole program could break.	True	False
6. The technical term 'execute' is used to start software.	True	False
7. When programs crash, end users often need to manually abort them and sometimes even restart their computer.	True	False
8. The term “execute” means "to put someone to death" in another context.	True	False
9. Open-source software is not always completely free to use and modify without restrictions.	True	False
10. Software programs are normally written and compiled for certain hardware platforms.	True	False

Task 8. What do the following phrases mean?

a) software
b) software developers
c) bugs
d) compatible

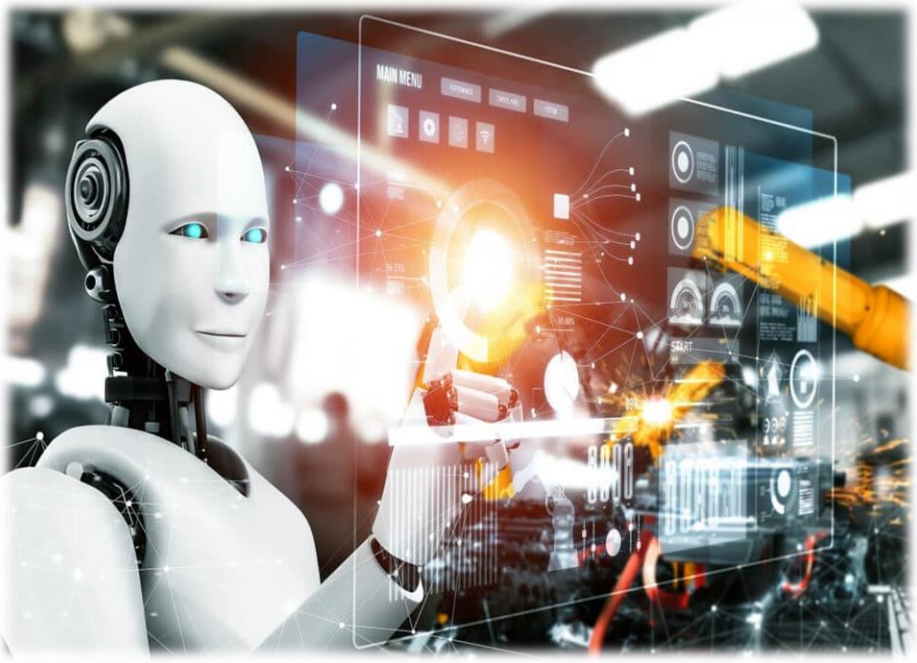
Task 9. Discussion Questions.

1. Why is it important for IT professionals to understand both closed source and open-source software?
2. How can software usability be improved for end-users?
3. What are the advantages and disadvantages of proprietary software?
4. Have you ever encountered a software bug or a program crash? How did you handle it?
5. Why do you think programming can be a valuable skill for IT professionals, even if they don't specialize in software development?

Task 10. Follow the link and try to answer a series of multiple-choice questions.

https://wordwall.net/resource/4404956

UNIT 7.
INDUSTRIAL ROBOTICS



Industrial robotics is an automation technology that has received considerable attention since about 1960.

Development of robotics

Robotics is based on two related technologies: ***numerical control*** and ***teleoperators***.

Numerical control (NC) is a method of controlling machine tool axes by means of numbers that have been coded on punched paper tape or other media. It was developed during the late 1940s and early 1950s. The first numerical control machine tool was demonstrated in 1952 in the United States at the Massachusetts Institute of Technology (MIT). Subsequent research at MIT led to the development of the APT (Automatically Programmed Tools) language for programming machine tools.

A teleoperator is a mechanical manipulator that is controlled by a human from a remote location. Initial work on the design of teleoperators started with the handling of radioactive materials in the early 1940s. In a common implementation, a person controls a mechanical arm and hand in one area, while the manipulator duplicates these actions in another.

Industrial robotics is a hybrid of numerical-control and teleoperator technology. The concept of a programmable industrial machine is provided by numerical control, while the concept of a mechanical arm performing meaningful labor is provided by teleoperator technology. The first industrial robot was installed in 1961 to unload parts from a die-casting operation. Its development was primarily owing to the efforts of two Americans, inventor George C. Devol and businessman Joseph F. Engelberger. Devol created the idea for a programmed manipulator, for which a US patent was obtained in 1961. Engelberger collaborated with Devol to promote the use of robots in industry and to establish the first corporation in robotics—Unimation, Inc.

(Adapted from Encyclopedia Britannica)

Task 1. Match the words on the left with their meanings or explanations on the right.

1. automation	a. Represented by symbols or numbers for a specific purpose.
2. numerical control	b. An idea or principle.
3. teleoperators	c. Capable of being programmed or controlled.
4. coded	d. To actively support and encourage the use or adoption of something.
5. programmable	e. The act of making a process or system automatic.
6. manipulator	f. A government license giving the holder exclusive rights to an invention.
7. concept	g. Mechanical devices controlled remotely by humans.

8. patent	h. A large company or business entity.
9. corporation	i. A method of controlling machine tool movements using numbers.
10. promote	j. A person or thing that manipulates or handles objects.

Task 2. Complete the sentences by filling in the blanks with appropriate words from the text.

1. _____ is the technology that has received considerable attention since about 1960.
2. Numerical control involves controlling machine tool axes using _____.
3. The first numerical control machine tool was demonstrated in 1952 at _____.
4. A teleoperator is a mechanical manipulator controlled _____.
5. Industrial robotics _____ numerical-control and teleoperator technologies.
6. George C. Devol and Joseph F. Engelberger played a crucial role in the _____ of industrial robots.
7. Unimation, Inc. was the first _____ in robotics.

Task 3. Write sentences using the following words from the text: *automation, concept, coded, patent,* and *promotion.*

1. The _____ of self-driving cars has gained momentum in recent years.
2. The inventor was delighted when he received the _____ for his groundbreaking invention.
3. The entire _____ process has significantly improved efficiency in the factory.
4. The software engineer _____ the complex algorithm to control the robotic arm.
5. The _____ of teleoperators was born out of the need to handle radioactive materials safely.
6. The company launched an extensive _____ campaign to introduce its new robotic products to the market.

Task 4. Words Exploration: Do you know antonyms for "robotics"? Here's a list of opposite words that you can use instead. Try to use them in your own examples.

Opposite of technology that is very advanced or modern =

primitive technology
archaic technology
old-fashioned technology
unsophisticated technology
obsolete technology

Identify synonyms for the term "robotics" and discuss their nuances and usage in the context of automation.

Task 5. Use the following words to create sentences related to the text: *teleoperators, automation, inventions, programming, corporations.*

Example: Automation revolutionized industries by integrating **teleoperators** into manufacturing processes, leading to groundbreaking **inventions** and the rise of powerful **corporations** in the tech sector.

Task 6. Answer the questions.

1. What are the key technologies that form the basis of robotics, as mentioned in the text?
2. Why was the development of numerical control significant in the history of industrial automation?

3. How did George C. Devol and Joseph F. Engelberger contribute to the advancement of industrial robotics?

4. In what ways do corporations play a role in advancing robotic technologies and their applications?

Task 7. Discussion Points

- ✓ How has automation technology transformed various industries since the 1960s?
- ✓ Discuss the ethical implications of widespread use of robots in industries.
- ✓ How do inventions like numerical control and teleoperators shape the future of work and manufacturing processes?
- ✓ Discuss the role of patents in protecting and incentivizing innovation in the field of technology.

Task 8. Choose among the suggested Creative Vocabulary Exercises, make your presentations in the classroom.

- Visual Storytelling: create a visual storyboard or comic strip that illustrates the development of industrial robotics from the early concepts of numerical control and teleoperators to the installation of the first industrial robot in 1961. You are free to use images and captions to narrate the progression.

- Timeline Construction: construct a timeline of key milestones in the development of industrial robotics, starting from the 1940s to 1961. Include important events, inventors, and technological breakthroughs. Add visuals and descriptions to each entry.

- Vocabulary Infographic: create an infographic that visually represents the relationships between numerical control, teleoperators, and industrial robotics. Include definitions, historical dates, and illustrations to enhance understanding.

- Craft a short fictional story that incorporates key terms from the text. The story should revolve around the development and use of industrial robots, showcasing their functions and benefits.

- Organize a class debate on the topic of industrial robotics. One group is in favor of industrial robotics and its impact on society and industry, and the other against it, focusing on potential job displacement and ethical concerns. Use key terms from the text in your arguments.

Task 9. Study the idioms and provide your own examples.

Idioms are phrases which have figurative meaning unlike literal meaning.

For example, "break a leg" means "good luck" and many others.

Learning tech idioms and phrases might be difficult, but it is essential for anybody looking to work in the IT business or interact successfully with tech experts. Understanding these popular computer idioms and phrases can help you navigate the world of technology and communicate more effectively with others. So,

whether you're a newbie or an experienced professional, take the time to become acquainted with this key terminology and idioms, and you'll be well on your way to speaking like a tech expert!

A LIST OF COMMONLY USED IDIOMS REGARDING TECHNOLOGY

1. ***Well-oiled machine*** - is used to describe something that works very well and effectively.

My computer works like a well-oiled machine.

2. ***Light years ahead*** - is used to describe someone who is much more ahead others in career, in personal development, etc.

I have no idea why boss promoted her, because I believe you are light years ahead of her.

3. ***On the same wavelength*** - is used to describe people who share the same views and opinions.

I suppose I have never been on the same wavelength with others, all always had other views than I had.

4. ***Driven by a motor*** - is used to describe people who are too hyperactive and too proactive.

After eating the chocolate my sister acts like she is driven by a motor.

5. ***Push the panic button*** - to become extremely afraid or nervous when something bad happens or might happen.

Medical officials say there is no need to push the panic button over two isolated cases of the disease.

6. ***Rocket science*** - is used to describe something which is complicated. Usually used in a negative meaning.

All you need to read are only few chapters, to pass the exam is not a rocket science!

7. ***Silver surfer*** - is an elderly person who uses the Internet.

Many companies promote computer education to elders to increase silver surfers amount in the country.

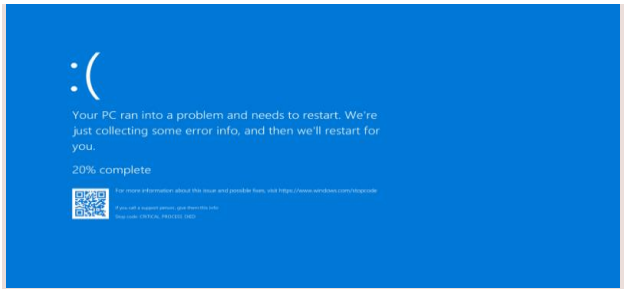
8. ***On the fly*** - If you do something on the fly, you do it quickly without thinking about it or planning it in advance, especially while something else is happening. In computer science, it can refer to changing code or settings in real time without shutting down the system.

The run-time code is loaded on to a real processor and translated on the fly into the chip's native instruction set.

9. ***Black box –*** This term refers to a computer system that is opaque or difficult to comprehend. The term “black box” is commonly used to characterize any processes or systems that are perceived as mysterious, impenetrable, or difficult to understand.

The compact and intelligent gadget includes 4 most useful mode: trip computer, digital gauges, scan tool and vehicle black box.

10. ***The blue screen of death*** is an error screen that shows in Microsoft Windows when the operating system detects a critical issue. This word has evolved to refer to any catastrophic failure or accident.



UNIT 8.

THE ROBOT MANIPULATOR

The most widely accepted definition of an industrial robot is one developed by the Robotic Industries Association:

An industrial robot is a reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks.

The technology of robotics is concerned with the design of the mechanical manipulator and the computer systems used to control it. It is also concerned with the industrial applications of robots, which are described below.

The mechanical manipulator of an industrial robot is made up of a sequence of link and joint combinations. The links are the rigid members connecting the joints. The joints (also called axes) are the movable components of the robot that cause relative motion between adjacent links.

As shown in Figure 1, there are five principal types of mechanical joints used to construct the manipulator. Two of the joints are linear, in which the relative motion between adjacent links is translational, and three are rotary types, in which the relative motion involves rotation between links.

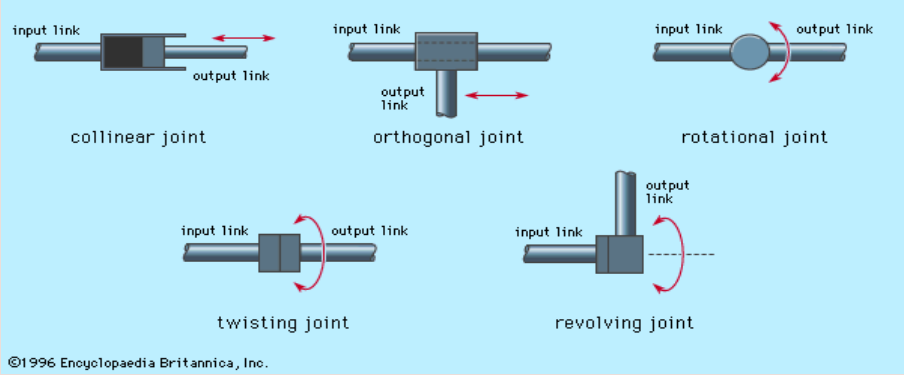


Figure 1. Types of mechanical joints used in robot manipulators

The manipulator can be divided into two sections: (1) an arm-and-body, which usually consists of three joints connected by large links, and (2) a wrist, consisting of two or three compact joints. Attached to the wrist is a gripper to grasp a work part or a tool (e.g., a spot-welding gun) to perform a process. The two manipulator sections have different functions: the arm-and-body is used to move and position parts or tools in the robot's work space, while the wrist is used to orient the parts or tools at the work location. The arm-and-body section of most commercial robots is based on one of four configurations. Each of the anatomies, as they are sometimes called, provides a different work envelope (i.e., the space that can be reached by the robot's arm) and is suited to different types of applications.

(Adapted from Encyclopedia Britannica)

Task 1. Define the following terms:

a. Robot manipulator
b. Mechanical joints
c. Arm-and-body section
d. Wrist section

Task 2. Comprehension Questions.

1. What is the primary purpose of an industrial robot?
2. What are the two main components of the technology of robotics?
3. How are the mechanical manipulators of industrial robots constructed?
4. How many principal types of mechanical joints are used in constructing a robot manipulator, and what are they?
5. What are the two main sections of a manipulator, and what are their respective functions?
6. How does the choice of manipulator configuration affect its work envelope?

Task 3. Read the beginning of the sentences and suggest their ending.

1. Industrial robots are automated machines designed to …….
2. These robots are equipped with …….
3. Common applications of industrial robots include …….
4. One of the significant advantages of industrial robots is ……...
5. Robots can handle the tasks …….
6. However, the integration of industrial robots also comes with …….
7. Despite the challenges, the use of industrial robots continues to ……...

Task 4. Choose the correct preposition to complete each sentence in the given paragraph.

1. Industrial robots are automated machines designed to perform various tasks **with / in / on** manufacturing and industrial settings.
2. These robots are equipped **from / with / for** advanced sensors and programming that allow them to carry **on / out / off** precise tasks with high efficiency.
3. Common applications of industrial robots include **in / -**welding, painting, assembly, and material handling.
4. One of the significant advantages of industrial robots is their ability to work **on / in / without** hazardous environments, such as factories with extreme temperatures or **exposure of / to / into** toxic materials.
5. Robots can handle these tasks **out / off / without** risking human safety.

Task 5. Replace the underlined words and phrases with the correct form of the words and phrases below. (Think about other appropriate synonyms)

concern	***integration***	***increase***	***complex***
require	***crucial***	***furthermore***	***cause***

However, the <u>implementation</u> of industrial robots also comes with challenges. Setting up and programming robots can be <u>complicated</u> and <u>demand</u> skilled technicians. Maintenance is <u>vital</u> to keep the robots operating smoothly. <u>Additionally</u>, <u>fears</u> about job displacement arise as automation <u>grows up</u> in the manufacturing sector.

Despite these challenges, the use of industrial robots continues to grow, <u>driven by</u> the need for improved productivity and efficiency in various industries.

Task 6. Search the additional information if needed to present your ideas on the suggested topics.

- Describe the functions of the arm-and-body section and the wrist section in an industrial robot. Explain how these sections work together to perform tasks.

- Discuss the importance of mechanical manipulator design in industrial robotics. Explain how the design of joints, links, and grippers can impact the robot's performance and versatility.

- Research and provide examples of real-world applications where industrial robots are used. Describe how the specific configurations and functions of the robots are suited for these applications.

- Imagine you are designing an industrial robot for a specific task, such as assembling electronic devices. Describe the ideal manipulator configuration and joint types you would choose, explaining your reasoning based on the provided information.

- Research and discuss how the field of robotics has evolved over the years, especially in terms of mechanical manipulators and control systems. What are some recent advancements in industrial robotics technology?

- Find a real-world case study of an industrial robot used in a specific industry (e.g., automotive manufacturing, food processing). Analyse how the robot's manipulator configuration and joint types contribute to its efficiency and effectiveness in that industry.

WORD STUDY **Up- and -up verbs**	**Task 7. Complete each gap in the sentences with the appropriate form of the correct verb from the list.**

back up ***keep up*** ***update***
build up ***set up*** ***upgrade***
catch up ***start up*** ***upload***
free up

1. To avoid losing data, you should _____ your files regularly.
2. You can _____ your PC by adding a new motherboard.
3. Delete some files to _____ space on your hard disk.
4. Data are _____ from regional PCs to the company's mainframe each night.
5. The operating system boots when you _____ your computer.
6. She's taking a course to _____ her knowledge of computing.
7. The computer checks the memory when it _____.
8. He _____ a website to advertise his travel company.
9. You can _____ with developments by reading PC magazines.
10. If you miss a class, you can study the hand-outs to _____.
11. The image in a digital camera is _____ from a red, green and blue image.

A prepositional phrase is a group of words that begins with a preposition and ends with a noun, pronoun, or noun phrase (this noun, pronoun, or noun phrase is the object of the preposition).

Prepositional phrases modify or describe nouns, pronouns, adjectives, adverbs, and verbs. They say something about the relationship between their object and the word they describe/modify. Prepositional phrases can tell us when [time] or where [location] something

is or something happened. They can tell us the direction something is or is moving/going. They can tell us something about the word or words they describe.		
WORD STUDY Prepositional Phrases with IN	**Task 8. Complete the sentences with a prepositional phrase from the box.**	
in addition to	in advance	in brief
in charge of	in common	in the course of
in danger	in debt	in demand
in depth	in effect	in favour of
in flames	in the long run	in order of
	in no time	

1. We can't go into a lot of detail now, but the issue will be covered _____ during the next term.
2. _____ the 1950s and 60s industrial output in Europe rose significantly.
3. Curfews have been _____ around the country for over two weeks.
4. My sister was deeply _____ and couldn't finance her monthly payments.
5. The policemen were _____ securing the crime scene and not letting anyone through.
6. In times of crises gold is _____ as a form of personal savings.
7. The old building across the street went up _____ after the bomb had exploded.
8. Tickets for the performance must all be booked _____.
9. The car is expensive to buy but _____ you will save a lot of money through better mileage.
10. The children are lined up _____ height.
11. _____ tests, the government will also provide all elderly citizens with the appropriate medicine.
12. The real estate agent promised us that our house would be sold _____ at all.
13. The two sides are not negotiating anymore, so the peace talks are _____ of collapsing.
14. A recent survey shows that most citizens are _____ building a sports centre near the motorway.
15. The two teams have a lot _____. For example, they are both extremely well organized.
16. As we do not have time for a full report, here are the results _____.

UNIT 9.
ROBOTS: FRIENDS OR FOES?

Task 1. Specialist Reading	**What is the future of artificial intelligence (AI)? Will it be possible for robots to be autonomous? If so, when will that happen and will it be a good thing? We asked four experts what they think.**

A I would say that we are quite a long way off developing the computing power or the algorithms for fully autonomous AI, though I do think it will happen within the next thirty or forty years. We will probably remain in control of technology and it will help us solve many of the world's problems. However, no one really knows what will happen if machines become more intelligent than humans. They may help us, ignore us or destroy us. I tend to believe AI will have a positive influence on our future lives, but whether that is true will be partly up to us.

B I have to admit that the potential consequences of creating something that can match or surpass human intelligence frighten me. Even now, scientists are teaching computers how to learn on their own. At some point in the near future, their intelligence may well take off and develop at an ever-increasing speed. Human beings evolve biologically very slowly and we would be quickly superseded. In the short term, there is the danger that robots will take over millions of human jobs, creating a large underclass of unemployed people. This could mean large-scale poverty and social unrest. In the long term, machines might decide the world would be better without humans.

C Personally, I think it's fascinating to consider how we'll speed up our evolution as a species by augmenting our bodies. Imagine if you could implant a computer inside our brain! Soon we'll be able to do just that and enhance our mathematical ability, audiovisual perception and our memory, and this idea is only going to become more and more commonplace. AI is also popping up in the world around us. Recent developments include self-driving cars and drones carrying life-saving equipment to people at sea. Granted, there have been a few teething problems: one woman who was asleep on the floor had her hair eaten by her robot vacuum cleaner and there have been fatal accidents with self-driving cars. But progress always comes at a cost, and for me the advantages far outweigh the disadvantages.

D I'm a member of the Campaign to Stop Killer Robots. Forget the movie image of a terrifying Terminator stamping on human skulls and think of what's happening right now: military machines like drones, gun turrets and sentry robots are already being used to kill with very little human input. The next step will be autonomous 'murderbots', following orders but ultimately deciding who to kill on their own. It seems clear to me that this would be completely unethical and dangerous for humanity. We need to be very cautious indeed about what we ask machines to do.

(Taken from BRITISH COUNCIL LearnEnglish Teens https://learnenglishteens.britishcouncil.org/skills/reading/c1-reading/robots-friend-or-foe)

Task 2. Match the vocabulary with the correct definition and write a–f next to the numbers 1–6.

1. a robot	a. an enemy
2. an algorithm	b. computer-controlled machine which can perform jobs without human input. It may have a human-like body
3. artificial intelligence (AI)	c. mathematical instructions which help a computer calculate an answer to a problem
4. a drone	d. the field of science concerned with producing machines with qualities of the human mind, e.g., the ability to understand language
5. a foe	e. independent, with the power to make your own decisions
6. autonomous	f. an aircraft without a pilot which is controlled by a human on the ground

Task 3. Choose a suitable verb for the definition suggested below.

to develop ***to supersede*** ***to take off***
to surpass ***to evolve*** ***to take over (from someone)***

1. to go beyond
2. to start doing something someone else was doing
3. to replace something older or less advanced
4. to suddenly start to be successful
5. to develop gradually (especially for a biological species)
6. to grow or improve, or to make something grow or improve

Task 4. Read the questions and choose the correct expert (A–D). Each expert may be chosen more than once.

1. *Which expert has a different view from the others regarding the timescale of AI becoming more autonomous?*
a. A b. B c. C d. D
2. *Which expert has a similar view to A about the responsibility humans have for the future of AI?*
a. A b. B c. C d. D
3. *Which expert agrees with B that the negative aspects of AI far outweigh the positive aspects?*
a. A b. B c. C d. D
4. *Which expert seems to disagree with B about how fast humans can change?*
a. A b. B c. C d. D
5. *Which expert gives their opinion about what will happen with the same level of certainty as D?*
a. A b. B c. C d. D

Task 5. Discussion questions.

Which of the points in the reading do you agree with?
Do you see robots as friends or foes?

1. Discuss the timeline for fully autonomous AI development mentioned in the text. Do you think thirty to forty years is a realistic estimate? Why or why not?
- What factors could accelerate or delay this timeline?
- How prepared do you think society is for such advancements?

2. What are the potential positive influences of AI on our future lives as mentioned in the text?
- Can you think of additional positive impacts not mentioned?
- How can we maximize the benefits of AI while minimizing potential risks?

3. The text mentions concerns about AI surpassing human intelligence. What are some of these concerns and do you share them? Why or why not?
- How can society address the fear of machines becoming more intelligent than humans?
- What measures can be put in place to ensure AI remains beneficial?

4. Consider the potential short-term and long-term consequences of AI on employment as discussed in the text.
- What jobs are most at risk of being replaced by robots and AI?
- How can society mitigate the impact of AI on employment and prevent large-scale poverty and social unrest?

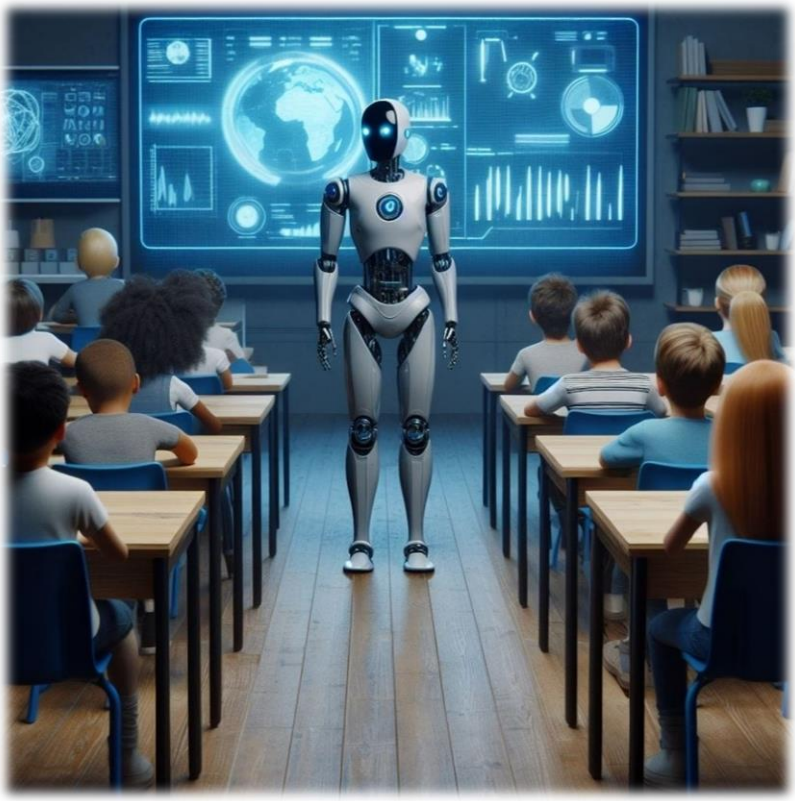
5. What do you think about the idea of augmenting human bodies with technology, such as implanting computers inside our brains?
- What are the ethical and practical implications of such advancements?
- How could this type of augmentation change the way we live and interact with the world?

6. The text mentions both successes and failures of recent AI developments, such as self-driving cars and drones. How do you weigh the advantages and disadvantages of these technologies?
- Should progress continue despite the risks, or should there be more stringent regulations?
- How should society handle the 'teething problems' that come with new technologies?

7. Discuss the ethical concerns surrounding the use of autonomous military machines, as described in the text.
- What are the dangers of allowing machines to make life-or-death decisions?
- How should international laws and regulations address the development and use of autonomous 'murderbots'?

8.What role do you think 'people power' should play in ensuring that AI and related technologies are developed and used in a socially responsible way?
- How can individuals and communities influence the direction of technological development?
- What actions can be taken to promote ethical standards in AI research and application?

UNIT 10. ROBOT TEACHERS



Task 1. Practise your reading skills.

If you think of the jobs robots could never do, you would probably put doctors and teachers at the top of the list. It's easy to imagine robot cleaners and factory workers, but some jobs need human connection and creativity. But are we underestimating what robots can do? In some cases, they already perform better than doctors at diagnosing illness. Also, some patients might feel more comfortable sharing personal information with a machine than a person.

Could there be a place for robots in education after all?

British education expert Anthony Seldon thinks so. And he even has a date for the robot takeover of the classroom: 2027. He predicts robots will do the main job of transferring information and teachers will be like assistants. Intelligent robots will read students' faces, movements and maybe even brain signals. Then they will adapt the information to each student. It's not a popular opinion and it's unlikely robots will ever have empathy and the ability to really connect with humans like another human can.

One thing is certain, though. A robot teacher is better than no teacher at all. In some parts of the world, there aren't enough teachers and 9–16 per cent of children under the age of 14 don't go to school. That problem could be partly solved by robots because they can teach anywhere and won't get stressed, or tired, or move somewhere for an easier, higher-paid job.

Those negative aspects of teaching are something everyone agrees on. Teachers all over the world are leaving because it is a difficult job and they feel overworked. Perhaps the question is not 'Will robots replace teachers?' but 'How can robots help teachers?' Office workers can use software to do things like organise and answer emails, arrange meetings and update calendars. Teachers waste a lot of time doing non-teaching work, including more than 11 hours a week marking homework. If robots could cut the time teachers spend marking homework and writing reports, teachers would have more time and energy for the parts of the job humans do best.

(Taken from BRITISH COUNCIL LearnEnglish Teens https://learnenglish.britishcouncil.org/skills/reading/b1-reading/robot-teachers)

Task 2. Decide whether the following sentences are true or false.

1. Most jobs seem as if they can be done by robots or computers.
2. Robots are always better at diagnosing illness than doctors.
3. Many experts agree robots will replace teachers by 2027.
4. One advantage of robot teachers is that they don't need to rest.

5. Robot assistants could help teachers by marking homework.
6. Some teachers use robots to reduce their time answering emails and marking homework.

Task 3. Match the definitions (a–f) with the vocabulary (1–6).

VOCABULARY	DEFINITIONS
1. a takeover	a. the ability to think of new ideas
2. to adapt	b. to think something is less than it is
3. to underestimate	c. to work out what kind of illness someone has
4. empathy	d. when someone takes control of something, like a job or a place
5. to diagnose	e. to change something so that it fits better
6. creative	f. the ability to deeply understand someone's situation or feelings

Task 4. Choose the best answer.

1. It's easy to think robots …
a. will replace people even if we don't like the idea.
b. are more capable than people and it's true.
c. can do less than people but it's not always true.

2. Anthony Seldon thinks teachers in the future will …
a. help robots in class.
b. teach knowledge to students.
c. no longer exist.

3. Robots will probably never …
a. have human understanding of emotions.
b. be a popular choice for teachers.
c. be intelligent enough to work in education.

4. Some parts of the world …
a. pay robots to teach.
b. already use robots in teaching jobs.
c. have a shortage of teachers.

5. Teachers …
a. work harder than office workers.
b. have less help than office workers.
c. leave their jobs to become office workers.

6. Robots could …
a. empathise with students.
b. mark homework.
c. prepare lessons.

Task 5. Discussion

1. Would you like to have a robot as a teacher? Could there be a place for robots in education after all?

2. What are the potential benefits of integrating robots into educational environments?

3. What are the potential drawbacks or challenges of using robots in education?

4. In what ways can robots support teachers in their instructional duties and classroom management?

5. What impact could robots have on student engagement and motivation in the classroom?

6. What ethical considerations should be taken into account when deploying robots in educational settings?

7. Ethical implications of using robots and automata in various aspects of life.

8. What technical skills will teachers need to effectively incorporate robots into their teaching practices?

9. What new types of educational robots might we see in the future, and what capabilities could they offer?

10. How can educators and policymakers prepare for the increasing presence of robots in education?

11. Can you share examples of successful implementations of robots in education? What made these implementations successful?

12. What role can students play in the design and implementation of robotic systems in education?

13. How can robots be used to personalize learning experiences for individual students?

Interview with a Robot Designer. (The interview can cover topics such as the design process, challenges faced, and the future vision for robotics.)

Prepare and deliver a tech talk presentation on a specific aspect of robotics or automata. Topics can range from the use of robots in healthcare to the development of humanoid robots.

Vocabulary

Task 6. If the word in bold is correct, put a tick. If it is incorrect, replace it with one of the words in bold from the other sentences.

1. The Internet is really a vast **console** of computers, all connected together. ..... .

2. Since we got **resource**, we've been watching music videos online. ..... .

3. Early computer games seem quite **nuclear** compared to today's games. .....

4. It seems to me that **primitive** power is far cleaner than oil. ..... .

5. These ancient tools have been **crafted** with an enormous amount of skill. ....

6. The next generation of games **technique** will have better graphics. ..... .

7. There's a **network** in computing called 'beta testing', which means you test something to see if it works properly before it becomes official. ..... .

8. This latest **breakthrough** will mean cheaper, faster internet access for all. ..... .

9. The computer has finished analysing all the **broadband**. .....

10. The sea is a great natural **data** but we need the right technology to use it. ..... .

Task 7. Complete using the correct form of the words in the box.

click	***complex***	***download***	***electronics***	***file***
manual	***offline***	***online***	***programmer***	***upload***

WANTED: COMPUTER GEEK

Some people think 'geek' is a negative term for someone who spends all their time on computers. Well, we at Compulearn think it's a positive thing! If you're interested in becoming a computer (1) ....., if you enjoy reading the (2) ..... to find out what's really going on inside consumer (3) ..... like the latest plasma TV, then we want to hear from you.

Our six-week course covers everything from (4) ..... music (5) ..... from the Internet to writing your own games. You'll learn how to (6) ..... your own website to the Internet and how to solve (7) ..... problems in the latest programming languages. Go (8) ..... now and visit us on the net. (9) ..... on "Opportunities" and start your future now.

If for any reason our website is (10) ....., or you are unable to connect to the Internet, call us on 0800-COMPULEARN.

PHRASAL VERBS **Read the explanations of the following phrasal verbs carefully, learn them.**

back up	make a copy of information on your computer; give support to someone by telling other people that you agree with them *backup (n)*
change around	move things so that they are in different places or positions
change into	stop being in one state, condition or form and start being in another, or make something do this
change out of	take off the clothes or a piece of clothing you are wearing and put on different ones
do away with	get rid of
do up	repair, paint and improve an old building, car, boat, etc; fasten (an item of clothing)
fade away	disappear slowly
key in	put information into a computer or other electronic machine using keys or a keyboard
make into	change someone or something so that they become something else
mix up	put things together without any order; think that one person or thing is another person or thing *mix-up (n)*
switch on/off	start/stop a machine/light etc., working
take apart	separate an object into pieces
test out	try using something such as a machine or product to find out whether it works correctly or is satisfactory
turn into	change or develop into something different;

	make someone or something change or develop into something different
use up	use all of a supply of something
wear out	use something a lot so that it no longer works, or can no longer be used

Task 8. Write a phrasal verb in the correct form to replace the words in italics. Use the word given in brackets.

1. Why don't you *remove* ..... those wet things and put something dry on? (out)
2. The image on the screen *slowly disappeared* ..... and I knew it was a computer virus. (away)
3. Let's *try* ..... your new game and see if it works. (out)
4. You'll regret it if you don't *make a copy* of ..... your important data. (up)
5. Have you *recorded on all of* ..... the blank CDs I gave you, or have you got some left? (up)
6. Did you hear they're thinking of *getting rid of* ..... identity cards? (away)
7. You need to *put in using the keyboard* ..... your details and then press 'enter'. (in)
8. We should *redecorate* ..... Jake's bedroom now he's left home. (up)

Task 9. Complete using the correct form of the phrasal verbs in the box.

change around • change into • make into • mix up • switch on • take apart • turn into • wear out

1. Could you send someone to have a look at my computer, because nothing happens when I ..... it .....?
2. I ..... my watch ..... to see what was wrong with it, but I couldn't put it back together again!
3. Your essay would make more sense if you ..... the second and third paragraphs.
4. One of the miracles of nature is the way a caterpillar ..... a butterfly.
5. I played so much football last season that I ..... two pairs of boots!
6. In the story, Cinderella's coach ..... a pumpkin at midnight.
7. My CDs were all in order and now someone's ..... them .....
8. I think they've ..... the old library ..... a really nice space for children to read in.

Task 10. The phrasal verb *do up* means something like 'improve'. Put the following phrasal verbs into the sentences and tick the sentences where the phrasal verb means something like 'improve'.

bring up • brush up • cheer up • dress up • make up • take up • tidy up • turn up

1. Why don't you ..... yoga?	……
2. I was depressed all day, but I started to ..... when I saw Alec.	……
3. I'm going to ..... my French before we go on holiday.	……
4. How could you ..... such a ridiculous excuse?	……
5. If you ..... your room, then you'll be able to find things more easily.	……
6. Why did you have to ..... the fact that Dennis has lost his job?	……
7. Let's ..... and go out to that new Italian restaurant tonight.	……
8. What time did Nigel finally ..... at the party, then?	……

UNIT 11.
ROBOTS IN MANUFACTURING

Today, the majority of robots are utilized in manufacturing operations. Their applications are classified as follows:

1) material handling,
2) processing operations, and
3) assembly and inspection.

Material transfer and machine loading and unloading are examples of *material-handling applications.* Material-transfer applications necessitate the robot transporting materials or work parts from one area to another. Many of these operations are quite simple, needing robots to move parts from one conveyor to another. Other transfer procedures are more complex. They presuppose placing components on pallets in an arrangement that the robot must calculate. Machine loading and unloading operations require the robot to be equipped with a gripper that can grasp parts.

In robotic *processing operations*, the robot manipulates a tool to perform a process on the work part. Spot welding, continuous arc welding, and spray painting are examples of such uses. Spot welding of automotive bodywork is one of the most prevalent industrial robot applications in the United States.

Assembly and inspection are the third application area for industrial robots. Because of the high expense of manual labor in these operations, the usage of robots in assembly is projected to increase.

(Adapted from Encyclopedia Britannica)

Task 1. A. Identify synonyms for the following words. Use the adjectives in your own sentences. **Utilized** **Necessitate** **Manipulates** **Prevalent**
B. Find antonyms for the word "simple." Use them in description of any processing operation.

Task 2. Create sentences using the words "material handling," "processing operations," and "assembly" in a way that demonstrates their meanings.

Task 3. Research and define the term "gripper" as used in the context of robot operations, the terms "spot welding" and "continuous arc welding." Explain how they relate to robotic processing operations.

Task 4. Read the abstract and use the appropriate word.

The design of the product is an important aspect of robotic ***assembly/assemble***. Assembly methods that are ***satisfied/satisfaction/satisfactory*** for humans are not necessarily ***suit/suitable*** for robots. Using a ***screw/screwdriver*** and nut as a fastening method is easily performed in manual assembly. But the same operation is extremely difficult for a one-armed robot. Designs in which the ***components/compounds*** are to be added from the same direction using snap fits and other one-step fastening procedures enable the work to be accomplished much more easily by automated and robotic assembly methods.

Task 5. Complete the table. Categorize the types of applications mentioned (material handling, processing operations, and assembly/inspection). Provide at least one additional example for each category.

material handling	processing operations	assembly/inspection
machine loading	grinding	design
……..	……..	…….

SPEAKING	**Task 6. Choose any task for discussion and be ready to present your ideas in the classroom.**
Discuss the advantages and disadvantages of using robots in assembly and inspection operations, considering the mentioned high expense of manual labor.	**Explain why the use of robots in assembly is projected to increase, considering the context of the abstract.**
Share your thoughts on potential future developments or improvements in robotic applications based on the information provided in the abstract.	**Explore and discuss how the principles mentioned in the abstract could potentially be applied in fields other than manufacturing.**

Task 7. Read the theory and do the task suggested below.

A preposition is a word or group of words used before a noun, pronoun, or noun phrase to show direction, time, place, location, spatial relationships, or to introduce an object. Some examples of prepositions are words like "in," "at," "on," "of," and "to."

Prepositions in English are highly idiomatic. Although there are some rules for usage, much preposition usage is dictated by fixed expressions. In these cases, it is best to memorize the phrase instead of the individual preposition.

PREPOSITIONS OF DIRECTION

To refer to a direction, use the prepositions "to," "in," "into," "on," and "onto." *(drove **to** the store, Come right **in(to)** the house.)*

PREPOSITIONS OF TIME

To refer to one point in time, use the prepositions "in," "at," and "on."

Use "in" with parts of the day (not specific times), months, years, and seasons.	Use "at" with the time of day. Also use "at" with noon, night, and midnight.	Use "on" with days.
in the evening, in December, in 1996, in the fall.	**at 8:00, at noon, at midnight.**	**on Saturdays, on Wednesdays.**

To refer to extended time, use the prepositions "since," "for," "by," "during," "from…to," "from…until," "with," and "within."

*I have lived in Minneapolis **since** 2005.*
*He will be in Toronto **for** 3 weeks.*
*She will finish her homework **by** 6:00.*
*He works part time **during** the summer.*

PREPOSITIONS OF PLACE

To refer to a place, use the prepositions "in" (the point itself), "at" (the general vicinity), "on" (the surface), and "inside" (something contained).

*They will meet **in** the lunchroom. She was waiting **at** the corner.*
*He left his phone **on** the bed. Place the pen **inside** the drawer.*

To refer to an object higher than a point, use the prepositions "over" and "above."

To refer to an object lower than a point, use the prepositions "below," "beneath", "under", and "underneath".

*The bird flew **over** the house.*
*Basements are dug **below** ground.*
*There is hard wood **beneath** the carpet.*

To refer to an object close to a point, use the prepositions "by", "near", "next to", "between", "among", and "opposite."

*The gas station is **by** the grocery store.*
*Park your bike **next to** the garage.*
*There is a deer **between** the two trees.*
*There is a purple flower **among** the weeds.*

PREPOSITIONS OF LOCATION

To refer to a location, use the prepositions "in" (an area or volume), "at" (a point), and "on" (a surface).

*They live **in** the country. (an area)*
*She will find him **at** the library. (a point)*
*There is a lot of dirt **on** the window. (a surface)*

PREPOSITIONS OF SPATIAL RELATIONSHIPS

To refer to a spatial relationship, use the prepositions "above," "across," "against," "ahead of," "along," "among," "around," "behind," "below," "beneath," "beside," "between," "from," "in front of," "inside," "near," "off," "out of," "through," "toward," "under," and "within."

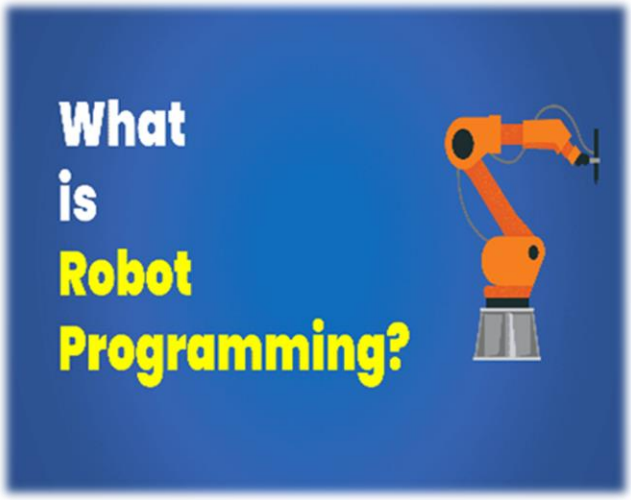
*The post office is **across** the street from the grocery store.*
*We will stop at many attractions **along** the way.*
*Walk **toward** the garage and then turn left.*

Insert the necessary preposition.

1. Inspection is another area … factory operations …. which the utilization … robots is growing.
2. … a typical inspection job, the robot positions a sensor … respect … the work part and determines whether the part is consistent … the quality specifications.
3. … nearly all industrial robotic applications, the robot provides a substitute … human labour.
4. There are certain characteristics … industrial jobs performed … humans that identify the work as a potential application for robots:

1) the operation is repetitive, involving the same basic work motions every cycle;
2) the operation is hazardous or uncomfortable … the human worker (e.g., spray painting, spot welding, arc welding, and certain machine loading and unloading tasks);
3) the task requires a work part or tool that is heavy and awkward to handle;
4) the operation allows the robot to be used on two or three shifts.

UNIT 12.
ROBOT PROGRAMMING



The computer system that controls the manipulator must be programmed to teach the robot the particular motion sequence and other actions that must be performed in order to accomplish its task. Industrial robots are programmed in several ways. One method is called ***lead-through programming.*** This requires that the manipulator be driven through the various motions needed to perform a given task, recording the motions into the robot's computer memory. This can be accomplished by either manually moving the manipulator through the motion sequence or by driving the manipulator through the sequence using a control box.

A second programming approach involves the use of a programming language that is similar to a computer programming language. The robot language, on the other hand, comprises statements particularly designed for robot control in addition to many of the characteristics of a computer programming language (i.e., data processing, calculations, interacting with other computer devices, and decision making). This includes (1) motion control and (2) input/output. Motion-control commands instruct the robot to move its manipulator to a specific location in space. The command "move P1" may, for example, be used to send the robot to a place in space called P1. To regulate the reception of signals from sensors

For instance, the statement "signal 3, on" might be used to turn on a motor in the cell, where the motor is connected to output line 3 in the robot's controller.

(Adapted from Encyclopedia Britannica)

Task 1. Match the following key terms from the text with their definitions.

1. Manipulator	A. The computer system that controls the robot's movements.
2. Lead-through programming	B. A method of programming where the robot's motions are physically demonstrated and recorded.
3. Robot language	C. A specialized programming language for controlling robots with motion and I/O commands.
4. Input/output commands	D. Commands used to control signals from sensors and other devices in the work cell.

Task 2. Determine whether the following statements are true or false based on the information in the text.

1. Industrial robots can only be programmed using lead-through programming. **True/False**
2. Motion-control commands in robot programming direct the robot to specific positions in space. **True/False**
3. Robot language includes capabilities for data processing and computations. **True/False**
4. Input/output commands are used to control signals from sensors but not other devices. **True/False**

Task 3. Fill in the blanks with the appropriate words or phrases from the text to complete the sentences.

1. _____ programming involves physically moving the manipulator through the motion sequence or using a control box to record motions.
2. The robot language includes statements for both motion control and _____.
3. In robot programming, "move P1" is an example of a _____ command.
4. Input/output commands are used to control signals from sensors and other devices in the _____.

Task 4. Read the text and do the suggested tasks below.

A) Find appropriate synonyms for the underlined words.

Robots have become essential in various industries, from manufacturing to healthcare. Programming these robots requires a combination of technical skills and creativity. There are two primary methods for robot programming: offline programming and online programming.

Offline programming involves creating a robot's program on a computer before transferring it to the robot itself. This method is preferred when precision and accuracy are crucial. Engineers use specialized software to design the robot's movements, specify its tasks, and define its interactions with the environment. These programs are then uploaded to the robot's controller, which guides the robot's actions in the real world.

Online programming, on the other hand, involves programming the robot in real-time while it is in operation. This method is useful for tasks that require adaptability and immediate responses. Operators use a control interface to guide the robot's movements, and they can make adjustments on the fly. It's like teaching the robot as it works, allowing for quick refinements and optimizations.

In both methods, a key aspect of robot programming is understanding the robot's kinematics and dynamics. Kinematics deals with the robot's motion and position in space, while dynamics involves the forces and torques it experiences during its actions. Having a grasp of these concepts is essential for creating efficient and safe robot programs.

B) Do you agree or disagree with the following statements? Explain your choice.

1. Online programming is preferable when precision and accuracy are essential.
2. Online programming allows for quick refinements and optimizations during robot operation.
3. Kinematics deals with the robot's interaction with the environment.
4. Dynamics involves the robot's motion and position in space.

C) Complete the conditional sentences using the words in parentheses.

1. If engineers _____ (not understand) the robot's kinematics and dynamics, they might encounter difficulties in programming.
2. _____ (you use) offline programming, you should ensure that the program is error-free before uploading it to the robot.
3. Online programming is ideal for tasks that _____ (require) immediate adjustments as the robot operates.

4. If the operator _____ (make) adjustments on the fly, the robot's performance can be optimized in real-time.

REVISION: COMPARISON AND CONTRAST

Study this comparison of digital and conventional cameras.

FEATURE	DIGITAL	CONVEN-TIONAL
lens	✓	✓
viewfinder	✓	✓
requires chemical processing	×	✓
Film		✓
transfer images directly to PC	✓	×
can delete unsatisfactory images	✓	×

Comparing features which are similar:

1. ***Both*** cameras have lenses.
2. ***Like*** the conventional camera, the digital camera has a viewfinder.

Contrasting features which are different:

1. The conventional camera requires chemical processing ***whereas*** the digital camera does not.
2. The conventional camera uses a film ***unlike*** a digital camera.
3. With a digital camera you can transfer images directly to your PC ***but*** with a conventional camera you need to use a scanner.
4. With a digital camera you can delete unsatisfactory images; ***however***, with conventional cameras you cannot.

CONTRASTING IDEAS

Although, despite, even if, even though, in spite of, much as, though, whereas and **while** are all used to link two contrasting ideas or show that one fact makes the other fact surprising. They can all be used at the beginning or in the middle of the sentence.

In spite of the heavy rain, the hikers continued climbing the mountain.
The hikers continued climbing the mountain ***in spite of the heavy rain***.

The main difference between these conjunctions is that they are followed by different structures.

IN SPITE OF/DESPITE + noun phrase or -ing form of a verb	**IN SPITE OF/DESPITE + the fact that** (followed by a subject and verb)
We arrived on time ***in spite of missing*** the train.	We arrived on time, ***in spite of the fact that we missed the train.***
Their restaurant succeeded ***despite the bad reviews.***	Their restaurant succeeded, ***despite the fact that they received bad reviews.***

ALTHOUGH, THOUGH and EVEN THOUGH + a subject and a verb

Although Marjorie lost the election, many more people voted for her than the first time.

I love my Italian conversation class, ***though*** I struggled at first.

I didn't know anyone when I first got to uni. I soon made friends, though.

Even though my team lost, it was great to be in the stadium for the final.

Though can also go at the end of the second phrase. This way of expressing contrasting ideas is most common in spoken English.

Even though is slightly stronger and more emphatic than although and though.

EVEN IF + a subject and a verb

Even if means 'whether or not' or 'no matter whether'.

Even if you are an expert swimmer, you should be careful at this beach.

WHILE AND WHEREAS

While is a conjunction that is most commonly used with time, but it can also be used to mean '**despite the fact that' or 'although'.**

While I made some mistakes in my driving exam, I still passed.

While and **whereas** can be used to mean '**but' or 'compared with the fact that'**, to compare two contradictory ideas.

While/Whereas Ivan is very sociable, his brother is more reserved.

My trip home was quick and easy, ***whereas/while*** my colleagues were delayed for hours.

MUCH AS = 'although', 'despite how much' or 'no matter how much'

Much as I enjoyed studying abroad, it was good to return home.

Task 5. Choose the correct answer.

1. _____ the delays caused by the bad weather, the trip went quite smoothly.
Although *In spite of* *While*
2. _____ socialising energises some people, it leaves others feeling tired and drained.
Despite *Even if* *Whereas*
3. We had a lot of tests in my language classes at school. I still loved English, _____!
although *much as* *though*
4. _____ the fact that he grew up in Canada, he gets cold very easily.
In spite of *Much as* *While*
5. Don't worry too much about the test today. _____ you fail, you'll still pass the course, which is the most important thing.
Despite *Even if* *Much as*
6. _____ this table is over two hundred years old, it's still in perfect condition.
Despite *Even though* *In spite of*

7. _____ all the difficulties she faced, Ellen never gave up on her dream of sailing solo around the world.

In spite of *Much as* *While*

8. My sister has four children, _____ I struggle with taking care of two guinea pigs!

despite *even* *while*

UNIT 13

MANUFACTURING APPLICATIONS OF AUTOMATION AND ROBOTICS

One of the most important application areas for automation technology is manufacturing. Many people associate automation with manufacturing automation. This text defines the various forms of automation and provides examples of automated systems used in manufacturing.

There are three forms of production automation: ***(1) fixed automation,***

(2) programmable automation, and (3) flexible automation.

Fixed automation, sometimes known as "**hard automation",** is a type of automated manufacturing facility in which the order of processing processes is determined by the equipment setup. In effect, the programmed commands are contained in the machines in the form of cams, gears, wiring, and other hardware that is not easily changed over from one product style to another.

This type of automation is characterized by high initial investment and high production rates. As a result, it is suitable for products that are made in large volumes. Machine transfer lines in the automobile sector, automatic assembly machines, and some chemical processes are examples of fixed automation.

Programmable automation is a type of batch manufacturing automation. The goods are manufactured in batches ranging from a few dozen to several thousand units at a time. The production equipment must be reprogrammed and swapped over for each new batch to fit the new product style. This reprogramming and changeover take time to accomplish, and there is a period of nonproductive time followed by a production run for each new batch.

Because the technology is designed to allow product turnover rather than product specialization, production rates in programmable automation are often lower than in fixed automation. A good example of programmable automation is a numerical-control machine tool. The program is coded in computer memory for each different product style, and the machine tool is controlled by the computer program. Industrial robots are another example.

Flexible automation is an extension of programmable automation. The time necessary to reprogram and change over the manufacturing equipment for each batch of a new product is a downside of programmable automation. This is lost production time, which is expensive. In flexible automation, the variety of products is sufficiently limited so that the changeover of the equipment can be done very quickly and automatically.

The reprogramming of the equipment in flexible automation is done off-line; that is, the programming is accomplished at a computer terminal without using the production equipment itself. Accordingly, there is no need to group identical products into batches; instead, a mixture of different products can be produced one right after another.

(Adapted from Encyclopedia Britannica)

Task 1. Answer the questions.

1. What is fixed automation, and why is it sometimes referred to as "hard automation"?
2. What components store the programmed commands in fixed automation machines, and why are they not easily changed for different product styles?
3. In what scenarios or industries is fixed automation considered suitable, and why?
4. Can you provide examples of products or processes that are well-suited for fixed automation?

Task 2. Fill in the blanks with the appropriate words from the box.

entered	***diversity***	***requirements***	***benefits***	***batches***

PROGRAMMABLE AUTOMATION DESIGN & VERSATILITY

Design and function of programmable automation processes offers manufacturers [1]_____ in production. Manufacturing products in [2]_____ allows for customization. With the manufacturing operations controlled by a program of instructions, new programs can be written and [3] _____ into the system to perform each manufacturing process as needed. Programmable changes in the manufacturing process allows for the frequent change of products at any time.

The equipment used in programmable automation must be designed specifically to adapt to ever changing production [4]_____. Being able to adjust for different operational sequences and product configurations is one of the prime [5] _____ of programmable automation.

Task 3. Use the necessary preposition.

IMPLEMENTATION OF PROGRAMMABLE AUTOMATION

1. Manufacturers must make an initial large investment ___ general-purpose equipment to reliably meet batch production quotas.
2. Compared ____ other industrial automation processes like fixed automation, production rates in programmable automation are lower.
3. For every change required to produce a new batch ____ products, the retooling and reprogramming requires a period of nonproduction ____ the changeover to occur.
4. Though the production rates may be lower than fixed automation processes, it ____ no means is unprofitable.
5. General-purpose equipment specifically designed ___ ease in adapting to product changeover rather than ____ production of a singular product offers flexibility over specialization.

Task 4. Choose the correct words to complete the text.

Flexible automation is a kind of programmable automation. Programmable automation [1]*requires/requests* time to re-program and change over the production equipment for each series of new product. This is lost production time, which is expensive. In flexible automation the [2]*figure/number* of products is limited so that the changeover of the equipment can be done very

[3]*quickly/quick* and automatically. The reprogramming of the equipment in flexible automation is done at a computer terminal without using the production equipment [4]*itself/themselves*. Flexible automation [5]*argues/allows* a mixture of different products to be produced one right after another.

Task 5. Give definitions to the following terms.

Fixed automation	***Assembly machines***
Programmable automation	***Non-productive time***
Flexible automation	

Task 6. Read and translate the text. Make up the plan in form of questions, render the text.

New technologies

The idea of fully automated factories has long been present: customers place orders online, negotiating price, size, color, and batch size (sometimes as low as one) through electronic transactions. Intelligent robots and sophisticated machinery then quickly and smoothly fabricate a wide range of customized products on demand. The manufacturing and maintenance industries are now seeing the advancement of remote-controlled automation fulfill its promise.

Communications was undervalued in the decades-old machine-based vision of automation, which envisioned strong super-robots without humans to care for them. However, networked intelligence, which is already highly developed and accessible, is the only factor that matters in this situation today. Numerous sensors, lightning-fast networks, top-notch diagnostic software, and adaptable interfaces provide communications support of the highest caliber for automated processes. All of these features are highly reliable and enable widespread access to hierarchical diagnosis and error-correction advisories via centralized operations.

The large, centralized production plant is a thing of the past. Future factories will be compact and mobile, ready to relocate to locations with resources and consumers. For instance, it is actually not necessary to carry large quantities of raw materials to a factory for processing, and then large quantities of the finished product to the end user. This was accomplished in the past due to investments in personnel, technology, and equipment as well as localized know-how. These days, those items are accessible everywhere.

Technology related to new inflection points, such as nanotechnology and nanoscale assembly systems, MEMS and nanotech sensors (tiny, low-power, low-cost sensors that can measure anything and everything), the ubiquitous Internet, and machine to machine (M2M) networking, can and will spur growth in industrial automation. Multiprocessing and sophisticated adaptive systems will replace real-time systems. Complex adaptive systems, wireless things, and nanotechnology are the ways of the future.

LANGUAGE WORK	**FUNCTION OF AN ITEM**

We can describe the function of an item in a number of ways. Study these examples.

1. Using the Present simple

ROM ***holds*** instructions which are needed to start up the computer.

2. Used to-infinitive, Used for + -ing form
ROM is ***used to hold*** instructions which are needed to start up the computer.
ROM is ***used for holding*** instructions which are needed to start up the computer.

3. Emphasizing the function
The function of ROM is to hold instructions which are needed to start up the computer.

Task 7. Match each item in Column A with its function in Column B. Then describe its function in two ways.

1	**Electronic systems**	a	is to limit the number of personnel on the production site, reduce support costs and have easier access to expertise such as a vendor or operator expertise.
2	**Robots in automation**	b	is to transmit an intelligence signal from a source to a destination at some point away from the source.
3	**The main purpose of remote functions in industrial control systems**	c	are used for assembling, painting, welding, machine tending, material removal and polishing, as well as quality inspection.
4	**Communication automation**	d	are nanoscale devices used for measuring physical quantities and converting these to signals that can be detected and analyzed.
5	**Nanosensors**	e	are frequently used for ordering and purchasing goods and services or for selling, or billing for, agency goods or services.
6	**The purpose of a communication system**	f	increases efficiency and productivity. By automating routine tasks, businesses can reduce errors and improve the accuracy of their communications.

Task 8. Describe the functions of these items. Use the dictionary or internet resources if necessary.

ATM	***swipe cards***	***automated test equipment (ATE)***
barcodes	***an automated production line***	***mainframe computer***

Exercise 9. See how mechatronics help engineers create high-tech products such as industrial robots. Watch the video and give answers to the questions.
(https://www.britannica.com/technology/automation/images-videos)
1. What is mechatronics?
2. What activities are mechatronics engineers engaged in?
3. What tasks can be successfully performed by mechatronics engineers using the processed data of the computer?

UNIT 14
AUTOMATED PRODUCTION LINES

An automated production line is made up of a succession of workstations linked together by a transfer system that moves parts between them. This is an example of fixed automation since these lines are often set up for extended production runs, potentially producing millions of product units and operating for several years between changeovers. Each station is intended to conduct a specific processing function, allowing the part or product to be built step by step as it moves along the line.

A raw work part enters the line at one end, proceeds through each workstation, and emerges at the other end as a finished product. For an automated transfer line to function successfully, all of the operations, part transfers, and other activities must be properly scheduled and coordinated.

PLCs, or programmable logic controllers, are special computers that permit connections with industrial equipment (such as automated manufacturing lines) and can execute the timing and sequencing operations required to operate such equipment.

Automated production lines are used in a variety of sectors, most notably automotive, for procedures such as machining and pressworking. *Machining* is a manufacturing process in which metal is removed by a cutting or shaping tool, leaving the desired shape on the remaining work component. This method is commonly used to manufacture machinery and motor components. *Pressworking* processes include the cutting and shaping of sheet metal pieces. Automobile body panels, outer shells of large appliances (e.g., washing machines and stoves), and metal furniture (e.g., desks and file cabinets) are examples of such pieces.

A complex element frequently demands more than one processing step. Several presses are linked in series by handling devices that move partially produced components from one press to the next, resulting in an automated pressworking line.

(Adapted from Encyclopedia Britannica)

Task 1. Read the definitions and connect them with the terms suggested.

1. Fixed automation	**A.** A succession of workstations linked together by a transfer system.
2. Workstation	**B.** Special computers that permit connections with industrial equipment and execute timing and sequencing operations.
3. Programmable logic controllers (PLCs)	**C.** Examples include the cutting and shaping of sheet metal pieces.
4. Pressworking	**D.** These lines are often set up for extended production runs and operate for several years between changeovers.

Task 2. Scan the text and decide whether the following statements are TRUE or FALSE.

1. An automated production line is an example of flexible automation. **True/False**
2. Workstations in an automated production line are not connected by a transfer system. **True/False**
3. Fixed automation is characterized by short production runs and frequent changeovers. **True/False**
4. A raw work part enters the line at the other end and proceeds through each workstation. **True/False**
5. Successful operation of an automated transfer line requires unscheduled and uncoordinated activities. **True/False**
6. Programmable logic controllers (PLCs) cannot connect with industrial equipment. **True/False**
7. Machining involves adding metal to the work component. **True/False**
8. Pressworking processes do not include the cutting and shaping of sheet metal pieces. **True/False**
9. Automated production lines are commonly used in the automotive sector. **True/False**
10. A complex element often requires only one processing step. **True/False**

Task 3. Comprehension Questions.

1. What is the basic structure of an automated production line, and how are its workstations connected?
2. Why is the automated production line described in the text considered an example of fixed automation?
3. What is the primary purpose of each station in the automated production line, and how does it contribute to the manufacturing process?
4. According to the text, what factors are crucial for the successful functioning of an automated transfer line?
5. What is the role of Programmable Logic Controllers (PLCs) in the context of automated manufacturing lines, and why are they significant?

LANGUAGE WORK	**PRESENT PASSIVE**

Study these sentences.

1. ***The radar sends out a beam of radio waves.***

2. ***The information is stored on a smart card.***

In 1 the verb is active and in 2 it is passive, the Present passive. *Why is this so? What difference does it make?*

In 1 the agent responsible for the action is included - the radar.

In 2 the agent is not included although we know what it is - the microprocessor.

The passive is often used to describe the steps in a process where the action is more important than the agent and where the agent is already known to the reader. If we need to add the agent, we can do so like this:

3. ***The information is stored on a smart card by the microprocessor.***

Task 4. Convert each of these statements to the Present passive. Add information on the agent where you think it is necessary.

1. Car assembly is a long process that requires a dependable supply chain to carry out uninterrupted production on the assembly line.

2. As the manufacturing process requires installation of numerous parts.

3. Automotive manufacturers do not completely rely on in-house production as they often purchase some parts from the vendors.

4. A modern assembly line uses both robots and humans for manufacturing processes.

5. We use robots in automotive manufacturing.

6. The programmed bots perform operations precisely and faster, with fewer chances of human error.

7. Designers develop ideas for new models to respond to public needs and preferences.

LANGUAGE WORK

ACTIVE VS PASSIVE

We use the ***active*** verb form in speech and writing to describe actions and events. For example:

Paper still plays a vital role in our lives - newspapers tell us the events of the day, and books entertain and educate us.

Paper has been with us since 105 A.D. The Chinese first used it to make records; later it spread to all parts of the world.

We can use the ***passive*** in the following situations:

1. We are not interested in the doer.

Ancient paper was made entirely of rags; modern paper is made from wood pulp - a faster and cheaper alternative.

2. In process descriptions.

First the logs are stripped of bark, cut into smaller sections, and made into chips. The chips are put into a large tank called a digester and allowed to stew in a chemical mix under pressure. The wood pulp that is created by this process is then washed to remove any chemicals and pressed through screens to remove chunks and foreign objects. The pulp is then drained of water to form a mass that is then bleached and washed again.

The first two corresponding ***active*** sentences would be:

First, we strip the logs of bark, then we cut them in to smaller sections, and make them into chips. We then put the chips into a large tank called a digester and allow them to stew in a chemical mix under pressure.

3. In impersonal language.

The chemicals in this process are toxic: safety clothing must be worn.

This is the typical style of a written order or instruction. The corresponding ***active*** sentence would be:

The chemicals are toxic: wear safety clothing.

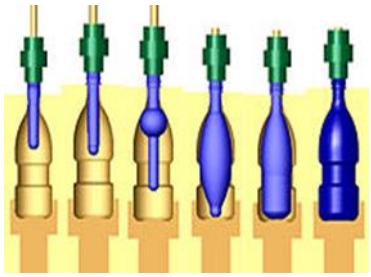
Task 5. Here is a list of changes which have taken place in a town between 1960 and today. Use these notes and the verbs given to write sentences to describe these changes.

Example: ***Four hotels have been built.***

2000	Today	Verb

No shopping mall	One large shopping mall	build
Two schools	Three schools	open
Old train station	Modern train station	renovate
Small Park	Expanded Park	enlarge
Only a few houses	Many new blocks of flats	construct
No bike lanes	Extensive bike lanes	create
Basic hospital	Advanced hospital	upgrade

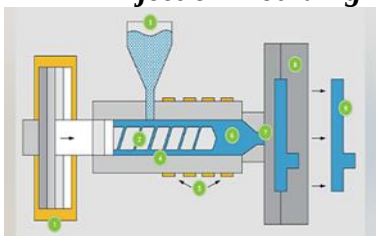
Task 6. In the following description of how plastics are shaped, put the verb in brackets in the correct form.



There are many ways of shaping plastics. The most common way is by moulding.

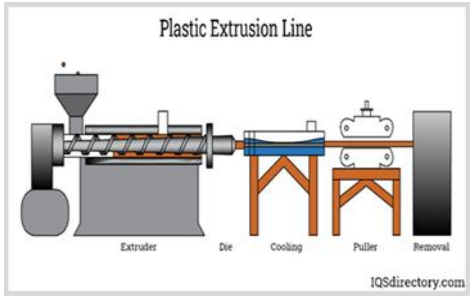
Blow-moulding …… [1](use) to make bottles. In this process, air …… [2](blow) into a blob of molten plastic inside a hollow mould and the plastic …… [3](force) against the sides of the mould.

injection moulding



Toys and bowls …… [4](make) by injection moulding. Thermoplastic chips [5]……. first ……. (heat) until they melt and then forced into a water-cooled mould under pressure. This method …… [6](suit) to mass production.

Laminating ……[7](produce) the heat-proof laminate which …… [8](use), for example for work surfaces in kitchens. In this process, a kind of sandwich …... [9](make) of layers of paper or cloth which …. [10](soak) in resin solution. They [11]…… then …… (squeeze) together in a heated press.



Thermoplastics can …… [12](shape) by extrusion. Molten plastic …… [13](force) through a shaped hole or die. Fibres for textiles and sheet plastic may …... [14](make) by extrusion.

Task 7. Rewrite the following sentences in the passive voice.

1. Engineers design advanced robots for manufacturing.
2. Scientists have already developed new algorithms for machine learning.
3. Companies will install automated systems in factories.
4. Technicians maintain the robotic equipment regularly.
5. Developers create software to control industrial robots.
6. Researchers are testing the robots for safety and efficiency.
7. Manufacturers produced thousands of robots last year.
8. The company will launch a new robot next month.
9. The team has implemented a new automation process.
10. The firm is upgrading the existing robotic systems.

UNIT 15.
AUTOMATION IN DAILY LIFE: COMMUNICATIONS, TRANSPORT

Aside from manufacturing applications, automation technology has made important advances in communications, transportation, service sectors, and consumer items.

Communications

Telephone switching was one of the first practical applications of automation. The original switching machines, introduced around the end of the nineteenth century, were basic mechanical switches that could be controlled remotely by the telephone user by pressing buttons or turning a dial on the phone. Modern electronic telephone switching systems are based on highly sophisticated digital computers that perform functions such as monitoring thousands of telephone lines, determining which lines require service, storing the digits of each telephone number as it is dialed, establishing the necessary connections, sending electrical signals to ring the receiver's phone, monitoring the call while it is in progress, and disconnecting the phone when the call is completed.

The newest electronic systems automatically transfer calls to alternate numbers, call back the user when busy lines become free, and perform other customer services in response to dialed codes. These systems also perform function tests on their own operations, diagnose problems when they arise, and print out detailed instructions for repairs.

Transportation

Automation has been used in the transportation industry in a variety of ways. Airline reservation systems, automated pilots in aircraft and trains, and urban mass-transit systems are examples of applications. Computerized reservation systems are used by airlines to continually check the status of all flights. Ticket agents in widely distant places may use these systems to acquire information on the availability of seats on any aircraft in a matter of seconds.

The reservation systems compare requests for space with the status of each flight, grant space when available, and automatically update the reservation status files. Passengers can even acquire their seat allocations well in advance of aircraft departures.

(Adapted from Encyclopedia Britannica)

Task 1. Scan the text and decide whether the following statements are TRUE or FALSE.

1. The first telephone switching machines were highly sophisticated digital computers.
2. Modern electronic telephone switching systems are able to monitor thousands of telephone lines.
3. One of the functions of the newest telephone systems is automatic calls transfer to alternate numbers.
4. Automated pilots in aircraft and trains are examples of applications of automation in the heavy industry.
5. Computerized reservation systems used by airlines check the status of all flights once a day.
6. Ticket agents in far-flung locations may utilize reservation systems to obtain information on seat availability on any aircraft in a couple of minutes.
7. One of the advantages of computerized reservation systems is the ability to book seats in advance.

Task 2. Fill in the blanks.

1. Switching machines of the 19th century were simple *working/mechanical* switches.
2. They were controlled by the telephone user by *pulling/pressing/pushing* buttons.
3. Modern electronic telephone switching systems are *made of/based on/produced by* highly sophisticated digital computers.
4. Modern systems call back the user when busy line becomes *free of charge/free/for free*.
5. Automation is used in the transportation industry in a *line/amount/variety* of ways.

Task 3. Read the text about other applications of automation in communications and decide which answer (A, B, C or D) best fits each gap.

Other applications of automation in communications systems include **1** _____ area networks, communications satellites, and automated mail-sorting machines. A local area network (LAN) **2** _____ like an automated telephone company within a single building or group of buildings. Local area networks are generally **3**_____ transmitting not only voice but also digital data between terminals in the system. Communications satellites have become essential for communicating telephone or video signals **4**_____ great distances. Such communications would be impossible without the automatic guidance systems that position and maintain satellites in fixed orbits. Automatic mail-sorting machines have been developed for use in many post offices throughout the world to read codes on envelopes and sort the envelopes according to **5**_____.

1	A. foreign	B. local	C. located	D. multistoried
2	A. demonstrates	B. transmits	C. declines	D. operates
3	A. unable to	B. entitled	C. used to	D. capable of
4	A. across	B. onto	C. under	D. among
5	A. destination	B. colour	C. level	D. handwriting

Task 4. Read the sentences and look at the highlighted prepositions. Choose the word that best fits the context.

1. Nearly all commercial aircraft are *divided/equipped/attracted* **with** instruments called automatic pilots.
2. **Under** normal flying *weather/conditions/circles*, these systems guide an airplane over a predetermined route by detecting changes in the aircraft's orientation.
3. Automatic navigation systems and instrument landing systems operate by using radio signals from ground beacons that *support/provide/suggest* the aircraft **with** course directions for guidance.

4. The wet weather had a very damaging *result/solution/effect/end* **on** tourism.

5. Robots might even become *interested/delighted/involved* **in** certain aspects of patient care such as transporting patients to services in the hospital, passing food trays, and similar functions

SPEAKING	**Task 5. Choose among the suggested tasks, share your ideas in the classroom.**
1. Create a timeline highlighting key milestones in the evolution of telephone switching technology. Include the introduction of basic mechanical switches, the transition to electronic systems, and the development of sophisticated digital computers. Make some research and add some new innovations.	**2. Design your version of a smart telephone switching system for the future. What features would it have? How would it improve upon the current systems? Use your creativity in considering the needs of users and potential technological advancements.**
3. Present a case study of a real-world situation where a telephone switching system malfunctioned, causing significant issues. Analyze the case, identify the problems, and propose solutions.	**4. Think about the future of telephone switching systems. What advancements do they predict in the next decade? How might artificial intelligence or other emerging technologies impact the field?**

UNIT 16
AUTOMATION IN DAILY LIFE: SERVICE INDUSTRIES

Service industry automation encompasses a wide range of applications as diverse as the services themselves, including health care, banking and other financial services, government, and retail commerce.

HEALTH CARE

Automation in the form of computer systems has expanded rapidly in health care to improve services and lessen the strain on medical staffs. Computer terminals on each nursing care floor in hospitals capture data on patient status, drugs provided, and other relevant information. The system keeps an official record of the nursing care provided to patients and is utilized by the nursing staff to present a report at shift change. The computer system is connected to the hospital's business office so that proper charges can be made to each patient's account for services rendered and medicines provided.

FINANCIAL SERVICES

To expedite the processing of massive numbers of papers and financial transactions, banking and financial institutions have embraced automation in their operations, mostly through computer technology. Checks are sorted using optical character recognition systems that use the special alphanumeric characters at the bottom of the checks. Almost all financial organizations use computer systems to compute and record bank balances.

Electronic banking systems, including automated teller machines, have been established by banks. These automated tellers, which are located in areas convenient for their customers, allow users to execute simple transactions without the assistance of bank personnel.

To report transactions via ticker tape or closed-circuit television, stock exchanges rely on computer-automated processes. Brokerage firms track their customers' accounts using a computerized computerized record-keeping system.

Monthly statements detailing the status of each account are generated automatically and distributed to consumers.

Account executives use video monitors in their desks to access current information on each stock fairly instantly while discussing potential purchases with their customers. To ease record keeping in sales and exchanges, stock certificates are often provided with machine-readable identifications.

(Adapted from Encyclopedia Britannica)

Task 1. Suggest your own ideas on the following issues.

1. Reflect on how the interconnected computer systems in health care contribute to improved services. What challenges or risks might arise from such extensive integration in the healthcare setting?

2. Explore the ethical considerations surrounding the use of automation in health care. What ethical dilemmas might arise from relying heavily on computer systems in patient care, and how can these be addressed?

3. Consider the use of automation in financial services. What measures and protocols should be in place to ensure the security and privacy of sensitive financial information, especially when using optical character recognition systems and automated teller machines?

4. Analyze the impact of automation, particularly in banking and financial services, on employment. How might the widespread adoption of automated processes affect job roles, and what new skills might be in demand?

5. Evaluate the user experience of electronic banking systems, including automated teller machines. How does the convenience for customers balance with potential drawbacks, and what improvements could be made to enhance user satisfaction?

6. Consider the text's mention of automation in various service industries. What future trends do you foresee in service industry automation, and how might these trends shape the way services are delivered and managed?

Task 2. Read the first paragraph about credit card transactions. Choose the correct answer (A, B, C or D).

Credit card transactions have also become **1** ……. automated. Restaurants, retailers, and other organizations are using systems that automatically check the **2** …… of a credit card and the credit standing of the **3** …… in a matter of seconds as the customer waits for the transaction to be finalized. Some credit card transactions trigger immediate transfer of funds **4** …… the amount of the sale from the cardholder's account into the **5** …… account.

1	A. immense	B. locally	C. highly	D. great
2	A. shelf life	B. transition	C. validity	D. suitability
3	A. cardholder	B. operator	C. clerk	D. shareholder
4	A. refer to	B. divide into	C. belong to	D. equal to
5	A. dweller's	B. buyer's	C. mayor's	D. merchant's

Task 3. Choose the correct word to complete the collocations in the sentences.

1. Many government services are automated by ***help/means/assistance/aid*** of computers and computerized databases.

2. The Internal Revenue Service (IRS) of the U.S. government must review and approve the tax ***planning/returns/policy/regulation*** of millions of taxpayers each year.

3. The detailed checking of returns is a task that has traditionally been ***made/existed/taken/done*** by large staffs of professional auditors on a sampled basis.

4. In 1985 the IRS began using a computerized system to automate the auditing procedure for the 1984 returns. This system is programmed to perform the ***complex/heavy/mixed/plain*** tax calculations on each return being audited.

5. As tax laws change, the system is reprogrammed to do the calculations for the year. The computerized auditing system has permitted a ***celestial/initial/substantial/spatial*** increase in the work load of the IRS auditing department without a corresponding increase in staffing.

Task 4. Choose the correct option to complete the sentences, paying attention to the preposition in bold that follows. What prepositions are the other words followed by? Which words are not usually followed by a preposition?

1. The prices were …… **to** those on the internet.
A. consistent B. matching C. comparable D. alike
2. The company was fined because its actions were not in ……
with the law.
A. contract B. accordance C. due D. assurance
3. He decided to write to the manager in ……. **of** the staff member's behaviour.
A. concern B. regard C. connection D. respect
4. The videos are ……. **for** anyone who wants to learn to play the guitar.
A. aimed B. intended C. directed D. focused
5. There's no need for you to be ……. **with** the arrangements for the meeting.
A. disturbed B. troubled C. Worried D. concerned

Task 5. Complete the sentences with a prepositional phrase from the box.

at risk – behind schedule – between the lines – in advance
in demand – in theory – in the long run - on alert - on and off – on display
on second thoughts – out of breath
out of shape – under arrest – under fire – with the naked eye

1. Because of the stormy weather many trains in the region are running …….
2. We were told by the travel agent to book ……. because the hotel is very popular among tourists.
3. I wanted to go to Spain over the extended weekend, but ……., I think I'll stay at home.
4. The young woman was ……. for possessing a substantial amount of drugs.
5. They used to have ……. relationship, but at the moment they're seeing each other quite often.
6. You can only see a few planets ……. To see the others, you need a telescope.
7. His plan seemed very good ……., but it didn't work out the way we wanted it to.
8. The President put troops and military advisors in the region ……., as a conflict seemed to be imminent.
9. Many tropical plants and animals are ……. of becoming extinct over the next few decades.
10. If you read …… you will clearly see what he means.
11. I can't compete with you at the moment because I'm completely ……. and need a few practice sessions.
12. Rembrandt's paintings were ……. at the national museum.
13. Electric bikes are currently ……. and manufacturers cannot keep up their production.
14. She ran so quickly she was completely ……. when she arrived.
15. The lieutenant's soldiers were ……., so he had to withdraw from the front lines.
16. It will take some time but, ……., all schools will be equipped with modern technology.

Task 6. Read the text. For questions (1-3) choose the correct answer (A, B, C or D).

Retail trade has seen a number of changes in its operations as a result of automation. Selling merchandise has typically been a very labour-intensive activity, with sales associates needed to assist customers with their selections and then finalize transactions at the cash register. Each transaction depletes the store's inventory, so the item purchased must be identified for reorder. Much clerical effort is expended by the store when inventory is managed by strictly manual procedures. Computerized systems have been installed in most modern retail stores to speed sales transactions and automatically update inventory records as the stock of each item is reduced. The systems are based on the Universal Product Code (UPC), originally adopted by the grocery industry in 1973, which uses optical bar-code technology. A bar code is an identification symbol consisting of a series of wide and narrow bars attached to each product that can be scanned and recognized by a bar-code reader. At the cash registers, these readers quickly identify the items being purchased. As the sales associate scans across the symbol using a laser beam reader, the product is properly identified and its price is entered into the sales transaction. Simultaneously, a record of the sale is made in the inventory files so that the item can be reordered.

1. What is **NOT TRUE** about selling merchandise?

A. As a result of automation, the retail sector has undergone a variety of changes in its operations.

B. When inventory is controlled purely manually, the shop expends a lot of clerical labor.

C. The Universal Product Code (UPC) is a bar-code technology originally adopted by the retail industry in the 19th century.

D. Only giant retail establishments have computerized systems in place to speed up sales transactions and automatically update inventory data as each item's supply is depleted.

2. Use the correct word combinations to complete the sentence.

A bar code is an identification symbol consisting of ..... that can be recognized by a bar-code reader.

A. a series of lines

B. unique patterns

C. visual aids

D. encoded patterns

3. What did we learn about a bar code?
A. Bar codes use a series of colours to identify products.
B. A laser beam reader is essential for recognizing bar codes.
C. Bar codes are only scanned at the booking office.
D. Bar codes are represented as a scheme of any product.

Task 7. Read the description of some consumer products. Choose one of the tasks below the text and be ready to share your ideas with the groupmates.

Consumer products ranging from automobiles to small appliances have been automated for the benefit of the user.

Microwave ovens, washing machines, dryers, refrigerators, video recorders, and other modern household appliances typically contain a microprocessor that works as the computer controller for the device. The consumer operates the appliance by programming the controller to perform the required functions, including timing (ovens, dryers), power levels (microwave ovens), input channels (video recorders), and other cycle options (washing machines). The programming of the device is done simply by pressing a series of buttons in the proper sequence, so the user does not think of the procedure as programming a computer.

The automobile is an example of a highly automated consumer product. The modern automobile is typically equipped with several microprocessors that operate a variety of functions, including engine control (fuel-air ratio, for example), the clock, the radio, and cruise control.

1. Imagine a new household appliance that could benefit from automation and microprocessor control. Describe the features, functions, and potential user interactions of this innovative product.

2. Design a user-friendly interface for programming household appliances. How can the process be made more intuitive and enjoyable for users, considering different age groups and technological comfort levels?

3. Research and predict the future advancements in automotive technology. How might microprocessor technology further evolve in automobiles, and what additional features could be integrated to enhance the driving experience?

4. Write a short story or scenario involving the use of automated household appliances in a futuristic setting. Explore the potential benefits, challenges, and societal impacts of widespread automation in everyday life.

5. Propose a do-it-yourself automation project for a common consumer product. It could involve integrating a microprocessor to enhance functionality or create a customized automation solution. Outline the steps, materials, and expected outcomes.

6. Identify an unconventional consumer product or item not mentioned in the text, and brainstorm how the integration of microprocessors could enhance its functionality or user experience. Present your ideas and reasoning.

7. Create an infographic illustrating the journey of a consumer product from manual operation to automation, highlighting key milestones, technological components, and user benefits. Use visuals and concise captions to convey the information.

Task 8. Use the word in brackets to create a new word that fits into the blank.

The Rise of Cars

Cars have given us freedom. We can go wherever we want to go, 1 …… (EVER) we want to go. They have also brought us 2 …… (DEPEND). We don't have to make compromises or take into 3 ……. (CONSIDER) where other people want to travel. Cars provide us with a personalised transport 4 …… (SOLVE) that's always available. But they have also changed the world we live in 5 …… (DRAMATIC).

If you had to consider the impact of cars on your town, you would probably think of traffic jams and the 6 …… (DIFFICULT) of getting around in the rush hour. Or maybe you would think about 7 …… (POLLUTE) and how 8 …… (POISON) fumes destroy buildings and roads. But you might not think about any of these things at all.

People buy more and more cars while roads keep getting 9 ……..…… (WIDE) to cope with the 10 …… (INCREASE) amount of traffic. Cars are everywhere. They invade 11 …… (FORMER) green spaces: lawns, flowerbeds or trees that used to line the roads. 12 ……..…… (PAVE) and streets become thin strips along the front of buildings, further narrowed by 13 …… (PARK) cars that invade the last remaining centimetres of pedestrian space.

We all enjoy the facilities that shopping malls and 14 ……..…… (ENTERTAIN) complexes bring us, because we can use our cars to get there. They are efficient, 15 …… (CONVIENIENCE) and fast. At the same time, we are 16 ……. (SAD) by the 17 …… (LOSE) of our local grocery stores, as well as beautiful houses and community centres. What we must realise is that these changes go hand in hand, and we are to blame.

Preferring our 18 ……..…… (FREE) to sharing transport with others, we get into our cars to get to our workplaces, do our shopping, or to go out to the theatre. Many people would even drive to go for a walk

in the fields. And wherever we drive, we have to park too. Parking spaces are huge areas of land used up by empty cars 19 …… (WAIT) for hours for their passengers to return. What used to be a vast 20 …… (GRASS) meadow now becomes a small muddy field, crisscrossed by tire tracks of several vehicles. Cars are changing the 21 …… (SCAPE). It will never be like it used to be again.

GRAPHS CHARTS DIAGRAMS	**Read the material on how to describe graphs, charts, and diagrams in a presentation. Use the information provided in your own presentation. For more information you can follow https://preply.com/en/blog/how-to-describe-graphs-in-english/**

A lot of presentations focus on data and numbers. When presenting and explaining data charts, graphs, and diagrams, you should help people understand and memorize their main points. Diagrams and other visuals are excellent tools for describing trends or showing relationships between two or more items.

INTRODUCE THE GRAPH

Your first step should be to present the graph to your audience. This means covering high-level information like:

Its title ***The topic*** ***Data source*** ***Time frame***

Here are some examples of how to do this:

This graph shows the relationship between X and Y.
This diagram is a visual representation of the process for…
This chart uses data from the Z Database.
The data in this graph is from 2022.

IDENTIFY KEY FEATURES

From there, you can describe the key variables that make up the graph. Graphs and charts typically have an x- and y-axis, which represent different variables. Describing these axes will help the audience understand how the graph displays data.

Here are some helpful phrases for identifying these variables:

The vertical axis shows…
The horizontal axis represents…
This curve illustrates…
The solid line shows…
The shaded area describes…
This coloured segment is for…
The red bar…

POINT OUT IMPORTANT INFORMATION

When describing graphs, start by recognizing the main patterns, trends, or relationships they show. For example, if the chart clearly shows an increase in revenue over the past year, you should highlight that first.

To describe the movement of the line, you should use appropriate verbs, adjectives, and adverbs depending on the kind of action you need to show. For this, ***you should use the following vocabulary***:

Verbs: rise, increase, grow, go up to, climb, boom, peak, fall, decline, decrease, drop, dip, go down, reduce, level up, remain stable, no change, remain steady, stay constant, stay, maintain the same level, crash, collapse, plunge, plummet.

Adjectives: sharp, rapid, huge, dramatic, substantial, considerable, significant, slight, small, minimal, massive.

Adverbs: dramatically, rapidly, hugely, massive, sharply, steeply, considerably, substantially, significantly, slightly, minimally, markedly, quickly, swiftly, suddenly, steadily, gradually, slowly.

You can also identify other notable information, like outliers. This shows you understand the data beyond the surface level.

SHARE YOUR CONCLUSIONS

Once you've described what you see in the graph, you need to explain what the data means. To come up with ideas, you can ask yourself questions like:

How does this data affect the future?
How can we learn from this data?
What can we do differently to improve?
What decisions should we make based on this data?

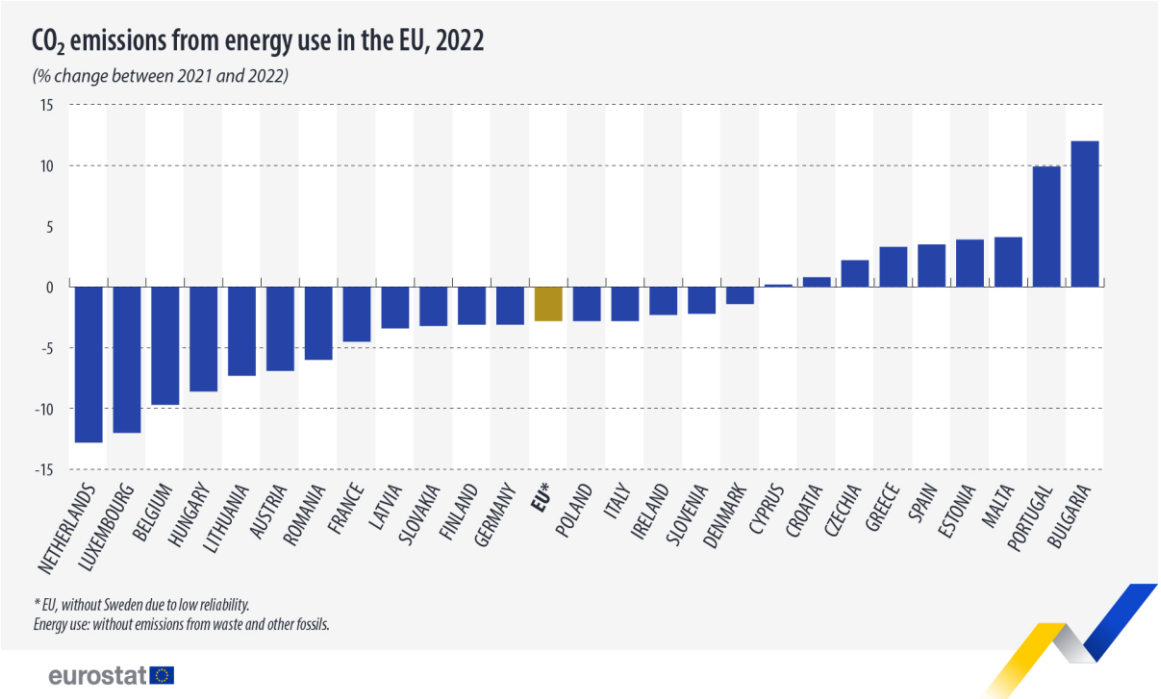
Some ways to explain your conclusions include:

Based on the graph, we can conclude that…
This chart indicates that…
As you can see, user growth has increased in the past year.
This means we expect to see more users in the next six months.

Exercise 9. Study the information and comment on it.

According to Eurostat estimates, in 2022, the EU carbon dioxide (CO2) emissions from fossil fuel combustion (oil and oil products, natural gas, coal and peat) for energy use in the EU territory reached almost 2.4 Gigatons (Gt), indicating a decrease of 2.8%, compared with the previous year. CO2 emissions from energy use are a major contributor to global warming and account for around 75% of all man-made greenhouse gas emissions in the EU. The fuel mix, housing standards, economic growth, size of the population, and transport and industrial activities are some factors that influence CO2 emissions from energy use.

Biggest decreases in CO2 emissions from territorial energy use in Netherlands, Luxembourg, Belgium and Hungary



(https://ec.europa.eu/eurostat/web/products-eurostat-news/w/DDN-20230609-2)

Task 10. Read a short text about electric vehicles. Think about their advantages over the traditional means of transportation.

Transportation is a major source of environmental pollution, mainly due to fossil fuel-powered vehicles emitting CO2 into the atmosphere. However, the shift towards green cars offers hope for a cleaner future.

Electric vehicles, or EVs, are another remarkable green technology innovation. Using electricity as their primary power source instead of gasoline or diesel, EVs produce zero tailpipe emissions, reducing the overall carbon emissions from transportation. With advancements in battery technology, EVs are becoming more accessible and practical for everyday use.

Companies like Tesla are leading the way in accelerating the transition to sustainable energy, offering electric vehicles that are not only environmentally friendly but also provide a better and more enjoyable driving experience than traditional gasoline cars.

Task 11. Read about a car of the future. Here are the words you will need to use. However, take care; this list contains twenty-five words, so there are five words that you will not need to use.

already	**always**	**can**	**dirty**	**easy**
even	**ever**	**faster**	**from**	**itself**
very	**maybe**	**today's**	**noisy**	**this**
drive	**wheels**	**there**	**like**	**say**
today's	**to**	**silent**	**tell**	**than**

Here is the car of the future! This car is the opposite of 1 …… cars; 2 ……. cars are 3 …… and dirty, this one is 4 …… and clean. Today's cars have 5 ……, this one does not. It moves 6 …… a snail, but much faster 7 …… a snail!

This car will use electric energy, not petrol or gasoline. It will have batteries that 8 …… be recharged instantly from chargers in the road. It will also be 9……. 10 …… to drive.

In fact, you won't need to drive it; it will drive 11 …… itself. You will just need to 12 …… the computer: "Go to X" and the car will go 13 ……. Also, it will reach X very quickly, much 14 …… than today's cars. It will also be very safe and comfortable.

A lot of the technology 15 …… exists, but it is very experimental. Already today scientists are developing new materials for the surface of roads. In fifty years 16 …… now, perhaps sooner, some new roads will capture solar energy: they will store 17 …… energy under the road, and some cars will be able to use it.

However, you probably won't 18 …… drive a "snail car", 19 …… if you're under 20 today. This, perhaps, is the car of the year 2100, the car that your grandchildren will 20 …… drive.

Driving will be nice in the 22nd century! No pollution, no traffic-jams, no stress. If, of course, we reach the 22nd century...

With all today's problems of global warming, pollution, viruses and natural resources, nothing is certain any more. Scientists have lots of ideas about the car of the future: but the future itself is perhaps less sure.

Complete the table writing down characteristics of today's cars and features of future cars.

Today's cars	Cars of tomorrow
powered by internal combustion engines running on gasoline or diesel.	capable of integrating with renewable energy sources for charging.
Comfortable interiors with adjustable seats, climate control, and high-quality materials. ……... …….. ……	Compact, efficient vehicles designed for urban environments and smart city integration. ..…… …….. ……..

GRAMMAR FOCUS	RELATIVE CLAUSES: DEFINING AND NON-DEFINING

DEFINING RELATIVE CLAUSES

Defining relative clauses are used to provide essential information about someone or something – information that we need in order to understand what or who is being referred to. A defining relative clause usually comes **immediately after the noun it describes**.

We usually use a relative pronoun (e.g. ***who, that, which, whose and whom***) to introduce a defining relative clause (In the examples, the relative clause is in bold, and the person or thing being referred to is underlined.):

They're the people **who want to buy our house**.
Here are some cells **which have been affected**.
They should give the money to somebody **who they think needs the treatment most.**
She's now playing a woman **whose son was killed in the First World War.**

SPOKEN ENGLISH

In defining relative clauses, ***that*** is often used instead of ***who***, ***whom*** or ***which***. (common in informal speaking)

They're the people **that** want to buy our house.

Here are some cells **that** have been affected.

SUBJECT OR OBJECT

The relative pronoun can define the subject or the object of the verb:

They're the people who/that bought our house. (The people bought our house. *The people* is the subject.)

They're the people who/that she met at Jon's party. (She met the people. *The people* is the object.)

Here are some cells which/that show abnormality. (Some cells show abnormality. *Some cells* is the subject.)

Here are some cells which/that the researcher has identified. (The researcher has identified some cells. *Some cells* is the object.)

NO RELATIVE PRONOUN

The relative pronoun is often left out when it is the object of the verb.

They're the people she met at Jon's party.

Here are some cells the researcher has identified.

PUNCTUATION

Warning: In writing, we don't use commas in defining relative clauses.

This is a man who takes his responsibilities seriously.

NON-DEFINING RELATIVE CLAUSES

Non-defining relative clauses are used **to give extra information about the person or thing. It is not necessary information.** We don't need it to understand who or what is being referred to.

A relative pronoun (*who, which, whose* or *whom*) is always used to introduce a non-defining relative clause.

*Clare, **who I work with,** is doing the London marathon this year.*

Alice, who has worked in Brussels and London ever since leaving Edinburgh, will be starting a teaching course in the autumn.

Warning: We don't use ***that*** to introduce a non-defining relative clause:

Allen, who scored three goals in the first game, was the only player to perform well.

PUNCTUATION

In writing, we use commas around non-defining relative clauses:

Etheridge, who is English-born with Irish parents, replaces Neil Francis, whose injury forced him to withdraw last week.

Spoken English:

In speaking, we often pause at the beginning and end of the clause:

And this woman – who I'd never met before – came up and spoke to me. (informal)

Task 12. Relative clauses – non-defining relative clauses. Complete the sentences with 'who', 'which', 'whose', 'when' or 'where'.

1. The new school, _____ has a pool, opened last week.
2. My cousin, _____ you met last year, just got married.
3. We visited the museum, _____ we all bought something.
4. She offered me a coffee, _____was just what I needed!
5. Yesterday, _____ was a holiday, we visited my sister-in-law.
6. He works with his parents, _____ company makes furniture.
7. The party's at the weekend, _____ more people can come.
8. The hospital, _____ local people depend on, is being closed down.

Task 13. Join the sentences to write a longer one.

Example: A man phoned. He didn't say his name. ***The man who phoned didn't say his name.***

1. A woman opened the door. She was wearing a yellow dress. The woman _____ a yellow dress.
2. Some people live next door to us. They are very nice. The people _____ .
3. A policeman stopped our car. He wasn't very friendly. The policeman _____.
4. A boy broke the window. He ran away. The boy _____.

Task 14. Write who/that/which in the blanks.

1. I met a woman _____ can speak six languages.
2. What's the name of the man _____ lives next door?
3. What's the name of the river _____ goes through the town?
4. Everybody _____ went to the party enjoyed it very much.
5. Do you know anybody _____ wants to buy a car?
6. Where is the picture _____ was on the wall?
7. She always asks me questions _____ are difficult to answer.
8. I have a friend _____ is very good at repairing cars.
9. A coffee-maker is a machine _____ makes coffee.
10. I don't like people _____ never stop talking.
11. Have you seen the money _____ was on the table?

L2. Why does he always wear clothes _____ are too small for him?

Task 15. Complete the sentences with the information in the box.

you went to a party;	***we looked at a map;***	***they live in a house***
Linda is dancing with a man;	***you were looking for a book;***	
~~you stayed at a hotel;~~	***I was sitting on a chair;***	***you spoke to a woman***

1. What's the name of the hotel *you stayed at*?
2. What's the name of the woman you _____?
3. The house _____ is too small for them.
4. Did you enjoy the party _____?
5. The chair _____ wasn't very comfortable.
6. The map _____ wasn't very clear.
7. Did you find the book _____?
8. Who is the man _____?

Task 16. Complete the sentences with one of the phrases in the box and who or whose.

interviewed me;	***book won a prize last week;***
has visited so many different countries;	***divorce was in the papers;***
~~had saved their son~~;	***car had broken down;***
wives have just had babies	***complain all the time***

1. The parents thanked the woman *who had saved their son*.
2. The couple _____ have got married again.
3. It is very interesting to meet somebody _____
4. The person _____ asked me some very difficult questions.
5. In my office there are two men _____
6. What's the name of that writer _____?
7. I don't like people _____
8. We helped the woman _____

Task 17. Put in who or that ONLY IF NECESSARY.

1. The match ----- we saw was boring.
2. Did I tell you about the people *who* live next door?
3. The horse *that* won the race belongs to an Irish woman.
4. I love the ice-cream _____ they sell in that shop.
5. The book _____ I'm reading is about jazz.
6. The woman _____ came to see us was selling magazines.
7. We'll go to a restaurant _____ has a children's menu.
8. The factory _____ closed last week had been there for 70 years.
9. Have you read about the schoolgirl _____ started her own business and is now a millionaire?
10. Jane says that the house _____ Tom has bought has a beautiful garden.

RELATIVE PRONOUNS WITH PREPOSITIONS

When ***who(m)*** or ***which*** have a preposition, the preposition can come

at the beginning of the clause:	or at the end of the clause:
*I had an uncle in Germany, **from who(m)** I inherited a bit of money.*	*I had an uncle in Germany, **who(m)** I inherited a bit of money **from**.*
*We bought a chainsaw, **with which** we cut up all the wood.*	*We bought a chainsaw, **which** we cut all the wood up **with.***

But when ***that*** has a preposition, the preposition always comes at the end:

*I didn't know the uncle **that** I inherited the money **from**.*
*We can't find the chainsaw **that** we cut all the wood up **with.***

UNIT 17

AUTOMATION IN DAILY LIFE: DOMOTICS

Task 1. Read a short abstract and be ready to explain in your own words what domotics is.

Domotics (from the Latin word "domus" meaning "house") is the intersection of information technology, electrotechnics, and electronics that transforms a home into a "smart" one. It is a tool that enables us to control systems, various gadgets and automations with the goal of improving the living conditions and comfort quality of our homes. And not only that. A building begins to acquire its "own intelligence," which is defined not by the quantity of high technology it includes, but by the manner in which technology integration is projected and how these technologies are able to meet the always changing demands of individuals.

The term ***domotics*** is now part of our lexicon as "a science related to electronics and information application to domestic life (household appliances and control systems) and that concerns the use of the appliances".

(Adapted from https://www.easydom.com/us/what-domotics-is)

Task 2. Think about possible ways of domotics application. Do you agree or disagree with the following statements? Add you own ideas.

1. Domotics can automate the process of turning lights on and off based on occupancy and time of day.
2. Domotics is primarily used for managing household chores like cleaning and cooking.
3. Domotics systems are capable of controlling security devices and cameras automatically.
4. The primary advantage of domotics is the enhancement of home entertainment systems.
5. Domotics can adjust air conditioning settings based on external temperature changes.
6. Traditional systems and partial automations provide the same level of comfort and security as domotics.
7. Domotics systems do not require any form of routine process or repetitive habit for automation.

Task 3. Read the text, explain what the words in bold mean.

Domotics: efficiency and comfort at home

Domotics is a method of controlling your house **remotely**. It can be either basic or complex, depending on your wish. But the main idea is that all home automation systems have certain similar components.

Domotics enables you to use numerous devices **simultaneously** and control them all from a single location, which is especially **beneficial** if more than one family member lives in the same house or flat. It also offers benefits for the elderly who live alone: they may use their phones or laptops to turn on lights, turn off alarm clocks, and even unlock their doors when they leave the house.

Since domotics refers to the use of electronic technologies to control and automate your house, it allows you to control your lights, appliances, heating, air conditioning, security system, and other

devices. It suggests the **additional** convenience: the ability to operate your house remotely. All the gadgets can be operated remotely by using your smartphone or tablet.

Main Uses of Domotics

Reducing the costs for electricity:	**Increasing your home's comfort:**	**Assist in protecting everyone's safety:**
simply set up a device to switch off lights and appliances when not in use.	the system may be setup in such a way that each user has their own profile with various settings. (e.g., eliminating the need to manually alter the temperature or lighting in each room).	controls the cameras and alarm systems both inside and outdoors.

Task 4. Form a different part of speech from the given words to complete the sentences.

1. Domotics enables _____ (use) to control their homes remotely.
2. The system can be set up to have _____ (person) profiles for each user.
3. By using domotics, _____ (elder) people can manage their homes more easily.
4. Domotics provides additional _____ (convenient) by allowing remote operation of devices.
5. One of the main benefits of domotics is the _____ (reduce) of electricity costs.
6. Domotics systems help in increasing the _____ (safe) of your home by controlling cameras and alarms.

DISCUSSION POINTS

Task 5. Think about answers to the following questions.

1. What can be automated in a home?
2. What types of domotics systems should be installed in a house?
3. What are the main benefits of using domotics in a home?
4. How can domotics contribute to energy savings?
5. What are some potential concerns or drawbacks of adopting smart home technology?
6. How might advancements in AI impact the future development of domotics?

Task 6. Read a text about home design and answer the questions. For questions 1 to 7, choose the correct answer.

Welcome to the home of the future

The 2009 British Homes Awards challenged the industry to design a house that can adapt to different life stages.

The participants were asked to rethink the construction and design of individual homes, so that they were easily adaptable to less mobile inhabitants, and also to create communities in which ageing occupants could continue to enjoy shared amenities.

The top design also had to be attractive to its potential buyers, because the competition was put to the public vote.

The winner, gaining 12,000 votes from Mail on Sunday readers, was the strikingly modern SunnySideUp, designed by Kosi Architects. Here are its three main features:

1. Upside Down House

The architects took as a starting point the accepted norm for a house – rows of houses facing onto streets crammed with cars, with living rooms on the ground floor and bedrooms above. Then they scrapped it.

They ended up with the living room, dining room and kitchen on the top floor where they can benefit from the light and views, and maximise energy efficiency. And they put the bedrooms on the ground floor where the garden aspect gives inhabitants increased privacy, and a cool temperature is

maintained throughout the day. The two floors are linked by wide, gentle gradient stairs, which are designed to allow for a stair lift to be fitted, if necessary, as owners age.

2. Concealed Parking Spaces

But the feature that, according to Warren Rosing, one of the Kosi architects responsible for the design, was particularly popular with the public, is actually the parking.

In a SunnySideUp development no one has to look out onto a street full of cars, or worry about their kids being run over, because the terrace zone at the first-floor level link all the homes and is a car-free zone.

Vehicles are tucked away on the lower floor, leaving safe and pleasant spaces outside the houses for people to meet, and kids to play.

A lift takes people directly from garage to living area, so that all residents, including the elderly and those with heavy shopping, can move comfortably between the floors. The natural feel of the front area is enhanced by the planters that are placed outside the kitchens at the front to encourage residents to grow vegetables and flowers where they can be seen.

The idea is that not only would they look pretty, but they would be a talking point, encouraging interaction between residents on the terrace area outside.

3. Flexible Spaces

But it's the fact that the space is designed to adapt to the changing needs, including the fluctuating income of its owners, that makes it a thought-provoking, as well as a winning, design.

The lower-floor bedrooms have separate outdoor access so they can be easily let. The idea is that owners can get some extra money to pay for their mortgages during the first years. And later in the future, those bedrooms can be used as a granny flat, or an office, and can easily be converted into a separate one-bed flat if your kids won't leave home.

And if more space is required, as well as the usual loft that can be converted, there is potential for a gallery floor to be inserted in the living room.

4. Where can you get one?

At the moment the SunnySideUp house is still just a set of drawings. But Warren Rosing says, "We are hoping to have it built."

The organizers are in talks with builders, but due to the economic climate it may take longer than we would like. "We're sure it will be worth the wait" they say.

(From Pruebas de Certificación de Idiomas 2010. Escuelas Oficiales de Idiomas del Principado de Asturias)

READING COMPREHENSION TEST

1. According to the article, The British Homes Awards challenged architects to design a house …

a. for disabled people
b. for ageing inhabitants
c. that could adapt to all ages
d. for young families with children

2. According to the article, in the winning property, bedrooms are downstairs to …

a. benefit from the view
b. have easier access to the house
c. have more privacy in the living room
d. keep the same pleasant atmosphere the whole day

3. According to the article, the parking spaces in this house design are …
a. on the first floor
b. on the ground floor
c. in a separate building
d. in the street

4. According to the article, in the SunnySideUp house the ground floor ...
a. can be rented
b. can be sold separately
c. is only used to store cars
d. has a room for grandparents

5. We learn from the article that …
a. children can play safely outside the house
b. the houses overlook a street crammed with cars
c. the back garden is the main talking point for the inhabitants

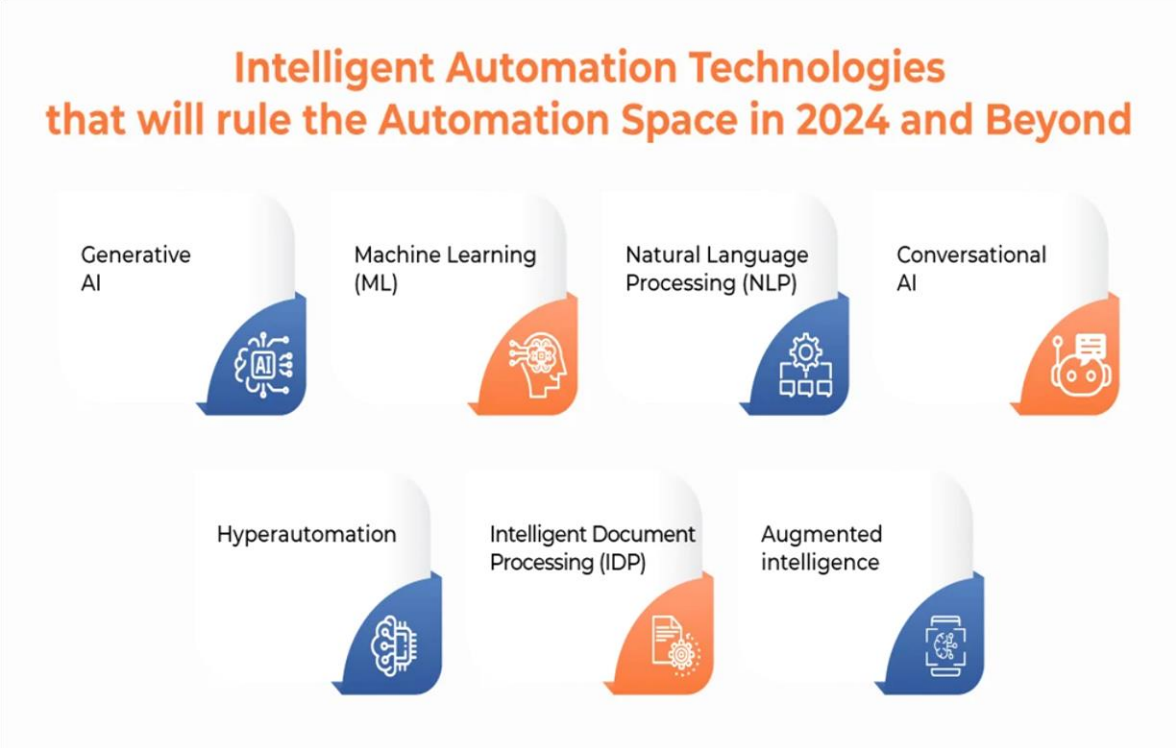
6. According to the article, the house has been designed …
a. to be rented
b. to be shared if necessary
c. for families with a small income

7. According to the article, the SunnySideUp development …
a. is being built
b. will never be built
c. will hopefully be built
d. has been recently built

SPEAKING TASKS: **TASK 1. ROLE PLAY**		**Partner A is a real estate agent showing Partner B, a potential buyer, the SunnySideUp house. Partner A should explain the unique features of the house and answer any questions Partner B might have.**
TASK 2: DEBATE	**Divide into two groups. One group argues that the SunnySideUp house is the best solution for future housing needs, while the other group argues that traditional house designs are still more practical and preferable.**	
TASK 3: PRESENTATION		**Prepare a short presentation on the importance of adaptable housing for an aging population. Include examples from the SunnySideUp house design to support your points.**

TASK 4: DISCUSSION	**In small groups, discuss how modern housing designs can improve the quality of life for all age groups. Consider aspects such as accessibility, community, and sustainability in your discussion.**

UNIT 18
INTELLIGENT AUTOMATION TECHNOLOGIES TO HAVE THE MOST IMPACT ON DIGITAL BUSINESSES



Task 1. Match the words in bold in the text with the meanings 1-5.

1. a situation in which people, businesses, etc. compete with each other for the same thing;
2. the application or study of computer systems or devices that mimic some aspects of the human brain, such as the capacity to identify or generate images, learn from data suggested, and understand and produce language in a way that looks human;
3. to set bounds for; to limit something;
4. to increase or improve something;
5. the quality of achieving the largest amount of useful work using as little energy (fuel, effort) as possible;
6. to state the worth of something.

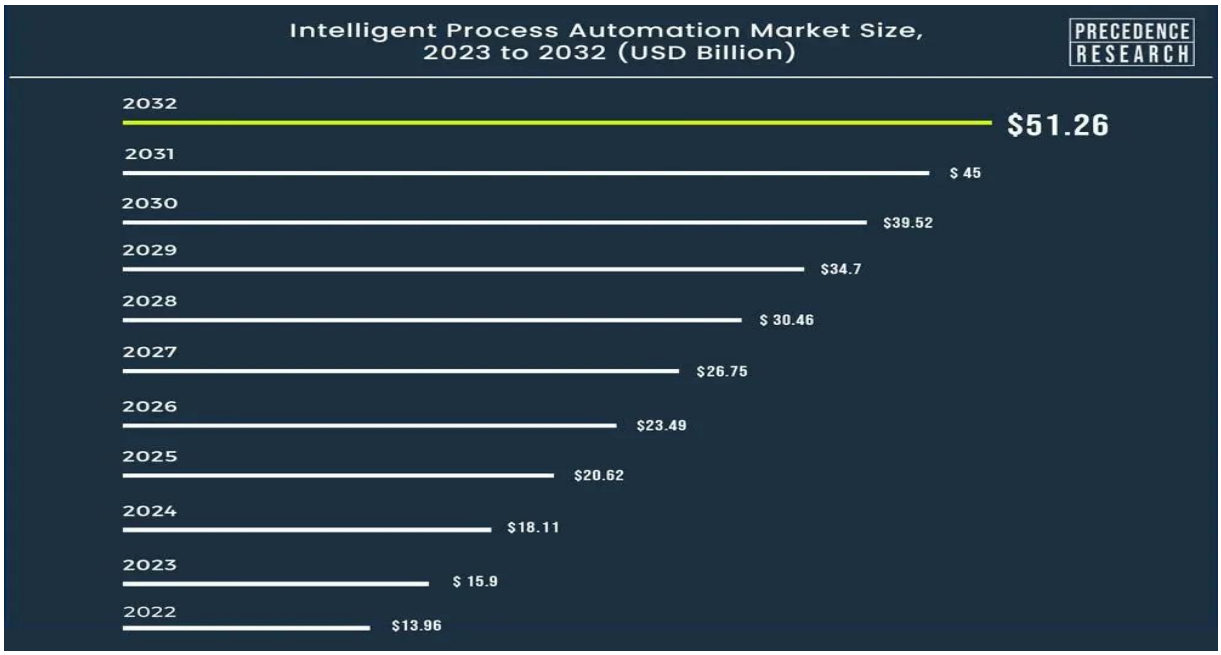
Task 2. Use the correct form of words from the previous exercise to complete the sentences.

1. The _____ between tech companies is intensifying as they compete for market dominance.
2. The company was _____ its output by implementing new technologies.
3. Businesses will rely more on _____ to handle complex data analysis.
4. In order to maintain security, the company already _____ employee access to sensitive information.
5. Our management hopes that the automation implementation will increase overall _____ in business operations.
6. Experts _____ the company's intellectual property at over a billion dollars.

Businesses nowadays don't want to **restrict** their capabilities to traditional automation due to the intensifying **rivalry** in the industry. According to the most recent technological trend, businesses are searching for intelligent automation solutions to address their business difficulties and **boost** accuracy, productivity, and **efficiency** — all of which have a multitude of positive effects on the company.

CIOs and IT leaders use innovative methods to integrate intelligent automation, machine learning, and predictive analytics — the three fastest-growing technologies in the industry today — into business initiatives. It is suggested that **artificial intelligence** (AI) may provide businesses with previously unheard-of levels of business solutions, analytics, and profound insights.

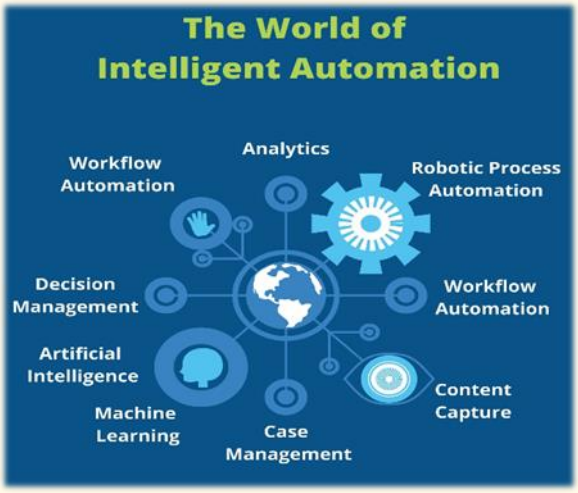
The intelligent process automation market was **value**d at USD 13.96 billion in 2022. It is expected to grow to USD 51.26 billion by 2032 with a compound annual growth rate (CAGR) of 13.89% from 2023 to 2032.



Task 3. Answer the following questions based on the abstract.

1. Why are businesses looking for intelligent automation solutions?
2. What roles do CIOs and IT leaders play in the integration of new technologies?
3. How does AI contribute to business initiatives?
4. What is the significance of the market growth rate for intelligent process automation?
5. How does the predicted market growth from 2022 to 2032 reflect on the industry's future?

WHAT IS INTELLIGENT AUTOMATION?



Intelligent automation is the process of automating and optimizing business operations through the use of cutting-edge technology: robotic process automation (RPA), artificial intelligence (AI), and business process management. Artificial intelligence (AI), machine learning, natural language processing (NLP), and automation technologies are the integral components used to increase productivity, boost decision-making abilities, and automate repetitive and rule-based processes.

Intelligent automation systems may carry out activities that have traditionally required human interaction. These machines are characterized by the capability to perform tasks with little human assistance required, analyze and interpret unstructured data, as well as make predictions.

(*Adapted from https://automationedge.com/blogs/intelligent-automation-technologies-and-trends/)*

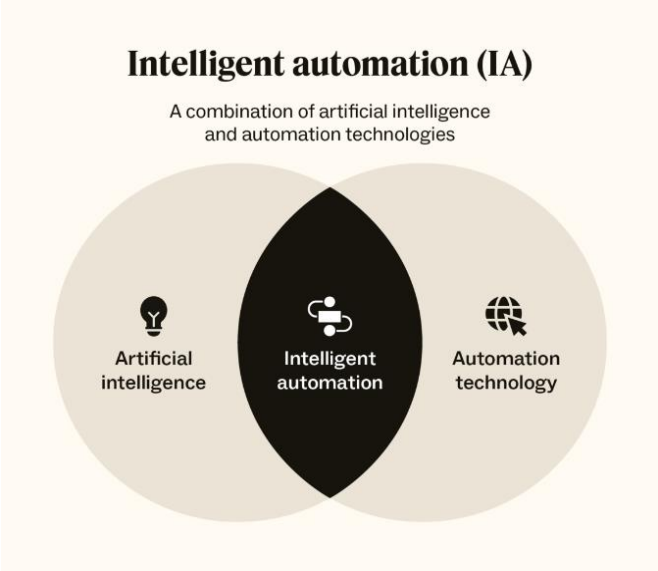
Task 4. Use the correct word for each sentence.

1. Intelligent automation is the process of using *natural – man-made – artificial* intelligence to make self-improving software automation.
2. Robotic process automation is a *wireless – hardware – software* technology used for automating repetitive and labor-intensive back-office workflows (e.g., filling in forms, searching for information, sorting invoices).
3. Intelligent automation involves a series of software processes that work *autonomously – collaboratively – independently* to optimize workflows.
4. Companies that choose to automate their repetitive tasks through IA have plenty of benefits, including increased *efficiency – affordability – affiliation,* cost savings and an improved customer experience.
5. Human employees are given more time to focus *of – off – on* the more strategic and creative aspects of their jobs.
6. By means of combining artificial intelligence, robotic process automation and business process management, intelligent automation can speed up business processes while *increasing – reducing – reimbursement* production costs.

Task 5. Read the information about Intelligent automation and its benefits for business operation.

Such terms as “cognitive automation” or “hyperautomation” can be also used to describe Intelligent automation.

As we already know, Intelligent automation is automated technologies that can help to streamline decision-making and automate business processes. It enables organizations to automate repetitive jobs and procedures. Intelligent automation in customer service, in addition to stand-alone solutions such as chatbots, enables operators to deliver quicker support.



Is there any distinction between AI and intelligent automation (IA)? - Of course, there is.

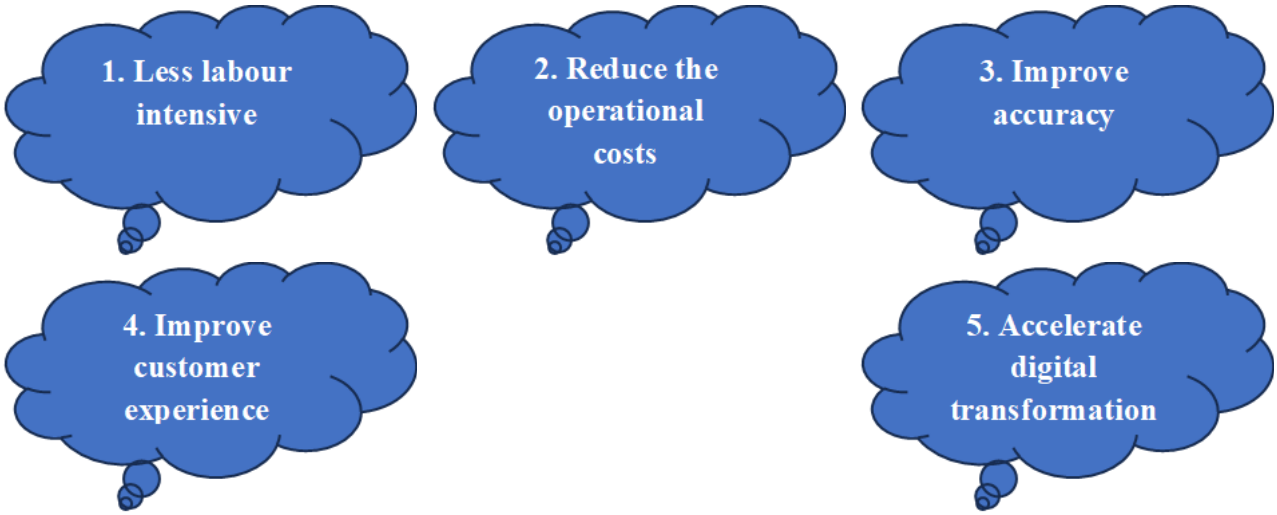
Put it simply, artificial intelligence is a tool for effective problem solving, but intelligent automation integrates several tools and technologies (including AI) to automate jobs, workflows, and processes.

Intelligent automation is represented as a combination of Robotic Process Automation (RPA) and Artificial Intelligence (AI) technologies.

Robotic Process Automation (RPA) helps to automate repetitive manual processes by using robots to carry out tasks. An example of this is processing invoices.

Artificial Intelligence (AI) is where machines learn human processes and learn to simulate them. An example of this is speech recognition software.

SO, WHAT ARE THE ADVANTAGES OF APPLYING INTELLIGENT AUTOMATION?



1. Less labour intensive.

Workers are able to focus on other parts of their roles when manual, repetitive activities and procedures are automated. It is a significantly less labour-intensive technique of working that helps to improve operational efficiency.

2. Reduce the operational costs.

Intelligent automation promotes increase in productivity. By using an automated process, you avoid placing unnecessary load on staff during busy periods. This can lead to economic savings, such as eliminating unneeded overtime.

3. Improve accuracy.

Data automation reduces the possibility of human mistake, such as missing phases or entering wrong data. More precise data also assist in corporate planning and critical decision making.

4. Improve the consumer experience.

The consumer is always viewed as the most important factor in business. Robots are accessible 24 hours a day, seven days a week, to accommodate consumers' hectic schedules.

Chatbots on websites are becoming prevalent, ensuring business continuation even after working hours. Implementing technology such as chatbots guarantees that clients receive quick responses and that the entire customer experience is improved.

5. Accelerate digital transformation.

Making progress on digital transformation is also becoming more crucial in company.

It allows organizations to get an advantage over their competitors by offering a better client experience. Adoption of intelligent automation technology enables businesses to simplify processes without disturbance. This also increases firms' resilience and ability to respond to changing markets, such as shifting customer habits during lockdown.

(Adapted from https://www.zendesk.com/blog/ai-automation/#)

Task 6. Match the following terms with their definitions.

TERMS	DEFINITIONS
1. Automation	a. The ability to recover quickly from difficulties; toughness.
2. Operational Efficiency	b. The process of using technology to perform tasks without human intervention.
3. Productivity	c. The efficiency with which an organization can convert inputs into outputs.
4. Digital Transformation	d. The process of integrating digital technology into all areas of a business.
5. Resilience	e. The measure of the efficiency of a person, machine, or system in converting inputs into useful outputs.

Task 7. Fill in the blanks with the appropriate word from the previous exercise.

1. Implementing _____ can help reduce repetitive tasks and improve accuracy.
2. To stay competitive, businesses must focus on increasing their _____.
3. The company's _____ was tested during the market downturn, but it managed to recover quickly.
4. _____ is essential for modern businesses to stay relevant in a rapidly changing market.
5. Enhancing _____ can lead to significant cost savings and better resource management.

Task 8. Read the following statements and mark if you agree or disagree. Provide a brief explanation for your choice.

1. Automation always leads to a better consumer experience.
2. Reducing operational costs through automation justifies potential job losses.
3. Improved accuracy through data automation is more important than human oversight.
4. Intelligent automation is essential for a company's digital transformation.
5. Automation should replace all manual, repetitive tasks in the workplace.

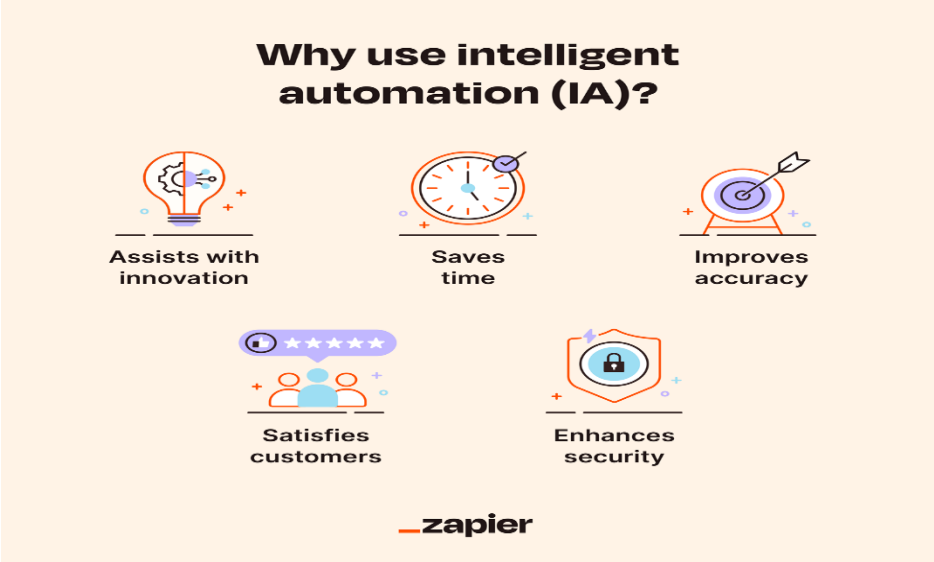
Task 9. Complete the table trying to answer the questions suggested. Be ready to present your ideas in the classroom.

Discuss the potential issues and benefits associated with each point.	
Less labour intensive: Discuss how automating tasks could impact employee morale and job satisfaction. Are there tasks that should not be automated?	***Reduce operational costs:*** Debate the potential downsides of reducing costs through automation, such as job losses or reduced employee hours.
Improve accuracy: Consider if there are situations where human judgment is crucial and cannot be replaced by automation.	***Improve consumer experience:*** Explore the balance between automated customer service and the need for human interaction.
Accelerate digital transformation: Discuss the challenges businesses face when implementing digital transformation, such as costs, training, and resistance to change.	

Task 10. The image below presents several benefits of using intelligent automation (IA). Provide a scenario for each benefit where intelligent automation could be applied.

Example:

Assists with innovation: − Automating repetitive tasks in a tech company to allow engineers more time for developing new products.



Task 11. Research and Presentation

Research a real-world company that has successfully implemented intelligent automation. Prepare a short presentation on how they utilized IA and the benefits they gained.

You can choose any relevant company such as Amazon (for its use of robotics in warehouses), IBM (for its use of AI in customer service), etc.

TEST TASKS FOR SELFCONTROL

1. Automation technology ___ rapidly over the last decade.
   A. improves
   B. improved
   C. has improved
   D. is improving
2. Scientists ___ on developing new machine programming languages.
   A. work
   B. works
   C. worked
   D. are working
3. By the end of next year, we ___ intelligent automation in all departments.
   A. implemented
   B. will have implemented
   C. are implementing
   D. implement
4. Industrial robotics ___ the way factories operate for years.
   A. changes
   B. changed
   C. has changed
   D. is changing
5. If the automation system fails, the company ___ a lot of money.
   A. loses
   B. lost
   C. will lose
   D. losing
6. Currently, researchers ___ the potential of robotics in manufacturing.
   A. explore
   B. explored
   C. are exploring
   D. have explored
7. Yesterday, we ___ a new automation technology in the lab.
   A. test
   B. tested
   C. will test
   D. testing
8. Tomorrow, I ___ a seminar on modern developments in automation technology.
   A. attend
   B. attended
   C. will attend
   D. attending
9. So far, we ___ any faults in the new system.
   A. do not find
   B. did not find
   C. are not finding
   D. have not found

10. When the robot completes the task, it ___ a report to the control center.
A. sends
B. sent
C. will send
D. sending
11. The new automation technology ___ currently by a team of engineers.
A. develops
B. is being developed
C. is developed
D. develop
12. The results of the experiment ___ by scientists next week.
A. analyze
B. analyzed
C. will analyze
D. will be analyzed
13. The latest model of the robot ___ (design) by engineers a few months ago.
A. has been designed
B. was designed
C. is designing
D. designed
14. Robots in manufacturing ___ to increase productivity.
A. use
B. used
C. are used
D. using
15. The malfunction ___ (just detect) by the system's sensors.
A. is detecting
B. has been detected
C. is detected
D. was detecting
16. The old machine programming language ___ soon.
A. replace
B. replaced
C. is replaced
D. will be replaced
17. New advancements in robotics ___ at the conference in Manchester on July,25.
A. announces
B. announced
C. are announced
D. were announced
18. Automation in daily life ___ in various service industries.
A. is implemented
B. implements
C. implemented
D. implementing
19. The impact of intelligent automation on digital businesses ___ extensively.
A. is studied
B. have been studies
C. studied
D. were studied

20. Safety protocols ___ strictly in industrial robotics.
A. are following
B. are follow
C. are followed
D. followed
21. If we ___ in automation technology, our production will increase.
A. invested
B. invest
C. will invest
D. investing
22. Provided that the new system ___ properly, we can save time.
A. functions
B. function
C. functioning
D. functioned
23. If robots ___ more affordable, more companies would use them.
A. are
B. were
C. will be
D. being
24. Unless we ___ our software, we can't keep up with competitors.
A. upgrade
B. upgraded
C. will upgrade
D. upgrading
25. If we had known about the benefits, we ___ automation earlier.
A. adopt
B. would adopt
C. would have adopted
D. adopting
26. Even if the machine ___ down, we have a backup system.
A. breaks
B. break
C. broke
D. breaking
27. If automation ___ more advanced, it will transform daily life.
A. becomes
B. become
C. becoming
D. became
28. Had they implemented automation, they ___ costs significantly.
A. reduce
B. will reduce
C. would reduce
D. would have reduced
29. If we ___ the new technology thoroughly, we would have avoided the issues.
A. test
B. tested
C. had tested
D. testing

30. Were the system ___, it would be a major setback for the project.
A. fail
B. fails
C. to fail
D. failing
31. Automation in ___ manufacturing industry has revolutionized production.
A. the
B. a
C. an
D. no article
32. ___ introduction of general scientific lexis is crucial for understanding technology.
A. A
B. An
C. The
D. no article
33. He is working on ___ project related to machine programming.
A. the
B. an
C. a
D. no article
34. ___ service industries are increasingly adopting automation.
A. A
B. An
C. The
D. no article
35. She read an article about ___ impact of robots in manufacturing.
A. a
B. an
C. the
D. no article
36. ___ modern developments in automation technology are fascinating.
A. A
B. An
C. The
D. no article
37. They attended ___ seminar on industrial robotics last week.
A. the
B. a
C. an
D. no article
38. ___ automation technology we saw at the fair was impressive.
A. The
B. An
C. A
D. no article
39. ___ robots used in the experiment were highly advanced.
A. The
B. An
C. A
D. no article

40. Understanding ___ general scientific lexis is important for engineers.
A. the
B. an
C. a
D. no article

41. Robots are essential ___ manufacturing processes.
A. for
B. in
C. on
D. to
42. Automation has a significant impact ___ daily life.
A. in
B. at
C. on
D. for
43. He is an expert ___ machine programming.
A. in
B. on
C. at
D. of
44. They discussed the latest trends ___ automation technology.
A. on
B. in
C. at
D. to
45. The conference will focus ___ intelligent automation.
A. on
B. in
C. at
D. to
46. She is interested ___ industrial robotics.
A. in
B. on
C. at
D. for
47. Robots can operate ___ high precision.
A. with
B. in
C. on
D. at
48. Automation can lead ___ increased efficiency.
A. to
B. on
C. at
D. for

49. They are working ___ a new robotics project.
A. in
B. on

C. at
D. for

50. He specializes ___ the development of automation systems.
A. in
B. at
C. on
D. for

51. Automation is becoming ___ than ever in manufacturing.
A. important
B. more important
C. most important
D. the most important

52. Robots are much ___ than humans at repetitive tasks.
A. efficient
B. more efficient
C. most efficient
D. the most efficient

53. This new system is the ___ we have seen.
A. advanced
B. more advanced
C. most advanced
D. the most advanced

54. The impact of automation on daily life is ___ than before.
A. significant
B. more significant
C. most significant
D. the most significant

55. Modern robots are ___ than older models.
A. intelligent
B. more intelligent
C. most intelligent
D. the most intelligent

56. She is the ___ expert in industrial robotics in the company.
A. knowledgeable
B. more knowledgeable
C. most knowledgeable
D. the most knowledgeable

57. Implementing automation is ___ than manual processes.
A. cost-effective
B. more cost-effective
C. most cost-effective
D. the most cost-effective

58. This method is ___ than the previous one.
A. reliable
B. more reliable
C. most reliable
D. the most reliable

59. He is one of the ___ engineers in automation technology.
A. experienced

B. more experienced
C. most experienced
D. the most experienced

60. The new robot is ___ than the old one.
A. fast
B. faster
C. fastest
D. the fastest

61. He said, “We will implement intelligent automation next month.”
A. He said that we will implement intelligent automation next month.
B. He said that we implemented intelligent automation next month.
C. He said that they would implement intelligent automation next month.
D. He said that they will implement intelligent automation next month.

62. “Automation technology has advanced significantly,” she said.
A. She said that automation technology has advanced significantly.
B. She said that automation technology had advanced significantly.
C. She said that automation technology will advance significantly.
D. She said that automation technology is advancing significantly.

63. They said, “We are developing a new machine programming language.”
A. They said that we are developing a new machine programming language.
B. They said that they were developing a new machine programming language.
C. They said that they are developing a new machine programming language.
D. They said that we were developing a new machine programming language.

64. “Robots can perform many tasks,” he said.
A. He said that robots can perform many tasks.
B. He said that robots could perform many tasks.
C. He said that robots performed many tasks.
D. He said that robots will perform many tasks.

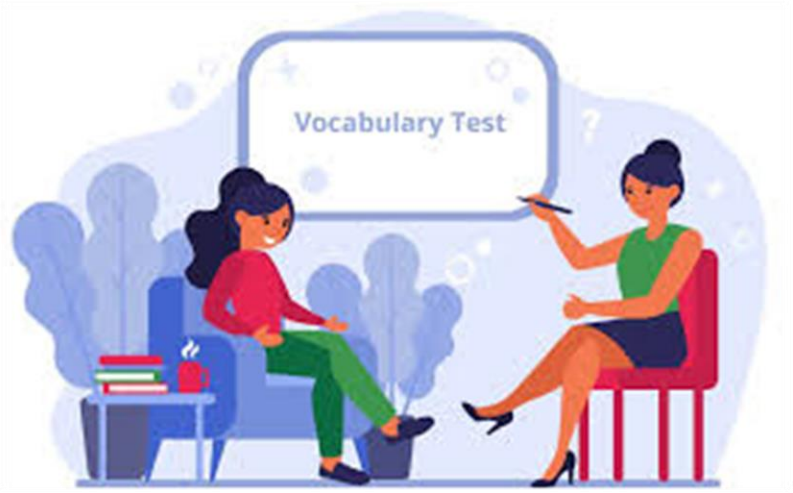
65. She said, “We need to study the impact of automation on daily life.”
A. She said that we need to study the impact of automation on daily life.
B. She said that they need to study the impact of automation on daily life.
C. She said that we needed to study the impact of automation on daily life.
D. She said that they needed to study the impact of automation on daily life.

66. “The new system will be tested tomorrow,” they said.
A. They said that the new system will be tested tomorrow.
B. They said that the new system would be tested tomorrow.
C. They said that the new system is tested tomorrow.
D. They said that the new system was tested tomorrow.

67. He said, “I am working on a project related to industrial robotics.”
A. He said that I am working on a project related to industrial robotics.
B. He said that he was working on a project related to industrial robotics.
C. He said that he is working on a project related to industrial robotics.
D. He said that I was working on a project related to industrial robotics.

68. “Automation in service industries is growing,” she said.
A. She said that automation in service industries is growing.
B. She said that automation in service industries was growing.
C. She said that automation in service industries will grow.
D. She said that automation in service industries grows.

69. They said, “We have not decided on the implementation date yet.”
A. They said that they have not decided on the implementation date yet.
B. They said that they had not decided on the implementation date yet.
C. They said that we have not decided on the implementation date yet.
D. They said that we had not decided on the implementation date yet.
70. “The seminar on intelligent automation was informative,” he said.
A. He said that the seminar on intelligent automation is informative.
B. He said that the seminar on intelligent automation was informative.
C. He said that the seminar on intelligent automation will be informative.
D. He said that the seminar on intelligent automation had been informative.



1. The _____ of automation technology has revolutionized many industries.
A. creation
B. invention
C. development
D. construction
2. Machine programming involves writing _____ for machines to perform tasks.
A. programs
B. diagrams
C. reports
D. essays
3. Industrial robotics are often used in _____ to increase efficiency.
A. schools
B. hospitals
C. factories
D. offices
4. Robots can perform _____ tasks that are repetitive and boring for humans.
A. complex
B. routine
C. spontaneous
D. accidental
5. _____ automation can help businesses improve productivity and accuracy.
A. Manual
B. Intelligent
C. Traditional
D. Basic

6. The _____ of a robot determines how it moves and functions.
A. algorithm
B. biology
C. material
D. philosophy

7. Domotics refers to the automation of _____.
   A. schools
   B. factories
   C. homes
   D. hospitals
8. In modern manufacturing, robots are used to _____ the assembly process.
   A. simplify
   B. complicate
   C. destroy
   D. ignore
9. Service industries increasingly rely on _____ to perform customer service tasks.
   A. humans
   B. robots
   C. animals
   D. volunteers
10. Predictive analytics use data to make _____ about future events.
   A. decisions
   B. predictions
   C. complaints
   D. excuses

11. Artificial intelligence (AI) can _____ large amounts of data quickly.
   A. ignore
   B. reject
   C. process
   D. delete
12. Robotic process automation (RPA) is used to _____ repetitive tasks.
   A. increase
   B. eliminate
   C. create
   D. complicate
13. Automation technology can _____ the quality of products.
   A. decrease
   B. destroy
   C. improve
   D. ignore
14. Intelligent automation systems can _____ and interpret unstructured data.
   A. generate
   B. refuse
   C. analyze
   D. delete
15. The _____ of robots in manufacturing has led to increased productivity.
   A. removal
   B. inclusion
   C. invention
   D. destruction

16. Modern developments in automation technology include advances in _____.
   A. agriculture
   B. transportation

C. medicine
D. robotics

17. Machine learning algorithms can _____ from data without being explicitly programmed.
A. learn
B. run
C. play
D. forget

18. The _____ of robots in daily life is becoming more common.
A. rejection
B. use
C. avoidance
D. criticism

19. _____ robots are used to perform tasks in hazardous environments.
A. Domestic
B. Educational
C. Industrial
D. Entertainment

20. The field of _____ focuses on designing and programming machines to perform tasks.
A. astronomy
B. robotics
C. chemistry
D. geology

21. Domotics aims to create a _____ living environment.
A. chaotic
B. hostile
C. smart
D. dangerous

22. Automation in daily life can _____ time and effort.
A. waste
B. consume
C. save
D. ignore

23. Intelligent automation technologies are expected to have a major ___ on digital businesses.
A. impact
B. burden
C. obstacle
D. distraction

24. Robots can _____ tasks that are dangerous for humans.
A. avoid
B. complete
C. neglect
D. abandon

25. Machine programming is essential for developing _____ systems.
A. random
B. chaotic
C. automated
D. manual

26. Predictive analytics helps businesses make ___ decisions.
A. random
B. informed
C. delayed
D. unplanned
27. The use of AI in robotics has _____ the capabilities of machines.
A. limited
B. decreased
C. enhanced
D. complicated
28. Industrial robotics can handle tasks that require _____ strength and precision.
A. human
B. minimal
C. limited
D. significant
29. Automation technology is often implemented to reduce _____.
A. efficiency
B. productivity
C. costs
D. profits
30. Robots in manufacturing are programmed to perform _____ tasks.
A. creative
B. repetitive
C. spontaneous
D. random

31. _____ robots are designed to assist with household chores.
A. Industrial
B. Medical
C. Educational
D. Domestic
32. Automation in the service industry can _____ customer satisfaction.
A. decrease
B. improve
C. ignore
D. harm
33. Machine learning involves training algorithms to _____ from data.
A. forget
B. learn
C. delete
D. avoid
34. Robotics in manufacturing has led to more _____ production lines.
A. disorganized
B. manual
C. efficient
D. chaotic
35. Intelligent automation systems can make _____ based on data analysis.
A. guesses
B. errors
C. decisions

D. excuses

36. The goal of automation technology is to increase _____ and reduce errors.
A. complexity
B. randomness
C. efficiency
D. confusion
37. Predictive analytics can help _____ potential problems before they occur.
A. ignore
B. create
C. foresee
D. invent
38. Domotics systems can be controlled remotely using a _____ device.
A. manual
B. stationary
C. mobile
D. broken
39. In industrial settings, robots are often used for _____ tasks.
A. unpredictable
B. repetitive
C. creative
D. social
40. Machine programming requires a deep understanding of _____ languages.
A. spoken
B. written
C. programming
D. foreign

41. The use of robotics in _____ has transformed the way products are made.
A. agriculture
B. manufacturing
C. education
D. entertainment
42. Intelligent automation can _____ productivity and accuracy in businesses.
A. reduce
B. maintain
C. disrupt
D. enhance
43. The main advantage of automation technology is the ability to perform tasks with _____ precision.
A. random
B. minimal
C. high
D. low
44. Robots that _____ dangerous tasks can help prevent human injuries.
A. avoid
B. perform
C. abandon
D. neglect
45. In the future, more homes will be equipped with _____ systems for convenience.

A. chaotic
B. outdated
C. automated
D. manual

46. The integration of AI in robotics has led to _____ advancements.
A. minor
B. significant
C. irrelevant
D. backward
47. Automation technology can handle _____ amounts of data efficiently.
A. tiny
B. limited
C. large
D. minimal
48. Intelligent automation systems can _____ from previous experiences to improve performance.
A. ignore
B. forget
C. learn
D. delete
49. Robots in the service industry can provide _____ assistance to customers.
A. manual
B. limited
C. efficient
D. irrelevant
50. Domotics aims to make homes more _____ using technology.
A. automated
B. traditional
C. inefficient
D. dangerous

51. Automation technology has significantly improved the efficiency of manufacturing processes. Robots are now capable of performing tasks that were previously considered too dangerous or repetitive for humans. In smart homes, domotics systems allow homeowners to control lighting, heating, and security remotely.
WHICH STATEMENT IS TRUE?
A. Automation technology has made manufacturing less efficient.
B. Robots can now perform tasks that are too dangerous for humans.
C. Domotics systems are used only for heating control.
D. Smart homes do not use any form of automation.

52. Smart homes equipped with advanced domotics can increase energy efficiency by automating lighting and heating based on the occupants' presence and preferences. This not only enhances comfort but also reduces energy consumption.
WHICH STATEMENT IS TRUE?
A. Smart homes decrease energy efficiency.
B. Domotics systems in smart homes are primarily for entertainment.
C. Smart homes use domotics to increase energy efficiency.
D. Occupants' preferences are not considered in domotics systems.

53. In modern manufacturing, the use of industrial robots has reduced production time and improved the consistency of products. These robots can work continuously without the need for breaks, unlike human workers.

WHICH STATEMENT IS TRUE?

A. Industrial robots increase production time in manufacturing.
B. Industrial robots need frequent breaks like human workers.
C. Industrial robots have improved product consistency in manufacturing.
D. Modern manufacturing avoids the use of robots.

54. Automation in the service industry includes the use of robots for tasks such as cleaning, food delivery, and customer service. These robots help to streamline operations and provide better service to customers.

WHICH STATEMENT IS TRUE?

- A. Automation in the service industry does not involve robots.
- B. Robots are used in the service industry to streamline operations.
- C. Service industry robots decrease the quality of customer service.
- D. Robots are not capable of performing cleaning tasks.

55. The integration of artificial intelligence (AI) in robotics has enabled machines to learn from their environment and improve their performance over time. This advancement is particularly beneficial in manufacturing, where precision and adaptability are crucial.

WHICH STATEMENT IS TRUE?

A. AI has made robots less adaptable in manufacturing.
B. AI integration in robotics hinders performance improvement.
C. AI allows robots to learn and improve over time.
D. Precision is not important in manufacturing.

56. Domotics systems in smart homes can strengthen security by using cameras, sensors, and automated locks. Homeowners can monitor their homes remotely and receive alerts about any unusual activity.

WHICH STATEMENT IS TRUE?

A. Domotics systems in smart homes do not enhance security.
B. Automated locks are not part of domotics systems.
C. Domotics systems allow remote home monitoring.
D. Homeowners cannot receive alerts from domotics systems.

57. The use of robots in manufacturing has led to a significant decrease in workplace accidents. Robots can handle hazardous materials and perform dangerous tasks, reducing the risk to human workers.

WHICH STATEMENT IS TRUE?

A. Robots increase the risk of workplace accidents in manufacturing.
B. Human workers still perform the most hazardous tasks in manufacturing.
C. Robots have reduced the number of workplace injuries by taking on hazardous tasks.
D. Robots are not used to handle hazardous materials in manufacturing.

58. Smart home technology allows users to control their home environment using smartphones or voice commands. This includes adjusting the thermostat, turning lights on and off, and locking doors.

WHICH STATEMENT IS TRUE?

A. Smart home technology cannot be controlled using smartphones.

B. Voice commands are not used in smart home technology.
C. Users can control their home environment with smart home technology.
D. Smart home technology does not include lighting control.

59. Automated vacuum cleaners are an example of how robotics can simplify daily chores. These devices can navigate around furniture and clean floors without human intervention.

WHICH STATEMENT IS NOT TRUE?

A. Automated vacuum cleaners help simplify daily chores.
B. These devices require human intervention to clean floors.
C. Automated vacuum cleaners can navigate around furniture.
D. Robotics can be used to automate household cleaning tasks.

60. In domotics, smart sensors can detect when a room is occupied and adjust the lighting and temperature accordingly. This not only improves comfort but also conserves energy.

WHICH STATEMENT IS TRUE?

A. Smart sensors in domotics do not detect room occupancy.
B. Adjusting lighting and temperature does not conserve energy.
C. Temperature adjustments are not possible with domotics.
D. Domotics utilize smart sensors for enhancing comfort and saving energy.

61. Automated assembly lines in manufacturing industries have significantly increased productivity by handling repetitive tasks with precision. These systems can operate continuously, ensuring consistent output quality.

THE PARAGRAPH IS ABOUT:

A. Automation in manufacturing
B. Precision tools in manufacturing
C. Quality control in manufacturing
D. Continuous operation in manufacturing

62. Domotics systems in smart homes enable residents to control various household functions remotely, such as adjusting temperatures and managing security settings. This technology enhances convenience and security.

THE PARAGRAPH IS ABOUT:

A. Remote control technology
B. Home automation systems
C. Temperature management in smart homes
D. Household security systems

63. Robotics in manufacturing have revolutionized industries by automating tasks that are physically demanding or hazardous for humans. This innovation has led to safer working environments and increased efficiency.

THE PARAGRAPH IS ABOUT:

A. Hazardous tasks in manufacturing
B. Efficiency in manufacturing
C. Automation benefits in manufacturing
D. Robotic advancements in manufacturing

64. Automated warehouse systems utilize robots to manage inventory and fulfill orders, improving logistics efficiency and reducing operational costs.

THE PARAGRAPH IS ABOUT:

A. Storage facilities automation
B. Inventory management
C. Logistics efficiency
D. Cost reduction in warehouses

65. Automation in manufacturing often involves the use of conveyor belts, which move products through different stages of production efficiently and consistently.

WHICH STATEMENT IS TRUE?

A. Conveyor belts are useless in automation.
B. Automation makes conveyor belts inefficient.
C. Conveyor belts enhance productivity in manufacturing.
D. Consistency is not a feature of conveyor belt automation.

66. Real-time network performance is critical for smart home devices. Connections to the devices are often choppy with an unacceptably annoying lag. Even simple tasks like turning off the lights with a voice assistant can take a few seconds. 5G and Wi-Fi 6 bring new heights to performance and capacity for IoT devices in the home automation market. These technologies provide faster speeds, lower latencies, and increased device connectivity. In the future, Wi-Fi 6 and 5G will complement each other. It will allow users to connect different terminals to the network through Wi-Fi and enjoy the high-speed network services brought by 5G.

WHICH SENTENCE CORRESPONDS TO THE TEXT?

A. Smart home devices require better network performance.
B. 5G and Wi-Fi 6 are irrelevant to smart home devices.
C. Turning off lights with voice commands is instantaneous.
D. Wi-Fi 6 and 5G improve speed and connectivity for IoT devices.

67. Edge computing helps to alleviate latency problems, decrease security threats, and optimize network resources. It assumes that compute power will be moved from remote cloud servers to closer data sources. The data acquired from the device is either analysed on the device itself (edge analytics) or at a local node located at the home network's peripheral (fog computing). Only a subset of data is sent to the remote server. Sensitive information can be handled at the edge, while only non-sensitive information is forwarded to the server. This assures strong security, excellent connection, and sufficient network bandwidth.

WHICH SENTENCE CORRESPONDS TO THE TEXT?

A. Edge computing increases latency and security threats.
B. Edge computing enhances security, reduces latency, and optimizes network resources.
C. Data analysis is primarily performed on remote cloud servers.
D. Edge computing moves compute power away from data sources.

68. Voice technology transforms the home automation market. According to a national CARAVAN poll done on behalf of Syntiant, the majority of Americans believe voice control is crucial in smart devices, especially in the COVID-19 time. Generation Z is the most likely to use voice control on smart devices (60%), followed by Millennials (56%), Gen X (54%), and Baby Boomers (43%). Voice assistant technologies like as Amazon Alexa and Google Home have made voice technology highly popular, and it is now considered essential in home automation development.

WHICH SENTENCE CORRESPONDS TO THE TEXT?

A. Voice control is unpopular among Baby Boomers.
B. Generation Z uses voice control less than Millennials.
C. Voice technology is deemed significant in home automation.

D. Voice assistants have no impact on smart device usage.

69. The security threats in home automation development range from device hijacking, payment fraud to private data and identity theft. An IoT app for smart home is a complex system consisting of many parts including physical devices, IoT gateways, protocols, data processing and data storage solutions, user-facing apps, and many more. And there’s a wide range of security issues in every part of the IoT solution. To get unauthorized information about users, hackers usually look for vulnerabilities in your server, infrastructure, network environment, databases, APIs, etc. To ensure your smart home app is well defended against criminals, you should implement security into every step of your home automation development.

WHICH SENTENCE CORRESPONDS TO THE TEXT?

A. Security threats in home automation development are non-existent.

B. IoT apps for smart homes are simple systems without security concerns.

C. Hackers exploit vulnerabilities in various parts of IoT solutions.

D. Smart home apps do not require security implementation.

70. There's a compelling incentive to have total control over your house using smart technology. Your smart home security system serves as the final line of defense between a robber and your valuables.

Smart lighting has several great benefits in terms of convenience and comfort, but what we haven't highlighted is its crucial function in home security:
it allows you to put up a random schedule that can make it appear like someone is home;
lighting schedules may be used with smart blinds to seem highly realistic;
if you detect an intruder, you can activate lights and/or sirens.

Security cameras are also an important aspect of the smart home setup as they might discourage thieves, support an insurance claim, assist law enforcement, and even lower insurance prices.

With today's technology, you can monitor what's happening in and around your house in real time from anywhere in the globe using wi-fi or a data connection.

WHICH SENTENCE CORRESPONDS TO THE TEXT?

A. Smart lighting is only useful for convenience, not security.

B. Security cameras are unnecessary in a smart home setup.

C. Smart technology provides little benefits for home security.

D. Smart home technology enhances security through features like smart lighting.

KEYS TO THE GRAMMAR TESTS

1-10: Verb Tenses

1. C
2. D
3. B
4. C
5. C
6. C
7. B
8. C
9. D
10. C

11-20: Passive Voice

11. B
12. D
13. B
14. C
15. B
16. D
17. D
18. A
19. A
20. C

21-30: Conditionals

21. B
22. A
23. B
24. A
25. C
26. A
27. A
28. D
29. C
30. C

31-40: Articles

31. A
32. C
33. C
34. D
35. C
36. C
37. B
38. A
39. A
40. D

41-50: Prepositions

41. D
42. C
43. A
44. B
45. A
46. A
47. A
48. A
49. B
50. A

51-60: Comparatives and Superlatives

51. B
52. B
53. C
54. B
55. B
56. D
57. B
58. B
59. C
60. B

61-70: Reported Speech

61. C
62. B
63. B
64. B
65. D
66. B
67. B
68. A
69. B
70. B

KEYS TO THE LEXICAL TESTS

1. C **2. A** **3. C** **4. B** **5. B** **6. A** **7. C** **8. A** **9. B** **10. B**	**11. C** **12. B** **13. C** **14. C** **15. B** **16. D** **17. A** **18. B** **19. C** **20. B**
21. C **22. C** **23. A** **24. B** **25. C** **26. B** **27. C** **28. D** **29. C** **30. B**	**31. D** **32. B** **33. B** **34. C** **35. C** **36. C** **37. C** **38. C** **39. B** **40. C**
41. B **42. D** **43. C** **44. B** **45. C** **46. B** **47. C** **48. C** **49. C** **50. A**	**51. B** **52. C** **53. C** **54. B** **55. C** **56. C** **57. C** **58. C** **59. B** **60. D**
61. A **62. B** **63. C** **64. A** **65. C** **66. D** **67. B** **68. C** **69. C** **70. D**	

IMPORTANT TECHNICAL ISSUES WITH THEIR DESCRIPTIONS

Accuracy	**the degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard;** **the quality or state of being correct or precise.** *The accuracy of modern cars' GPS navigation systems has significantly improved, allowing drivers to reach their destinations with precise turn-by-turn directions.*
Accuracy of robot	**Accuracy specification describes how close the arm will be when it moves to the desired point.** *The accuracy of the robot's movements was crucial for delicate surgical procedures.* *Engineers fine-tuned the robotic arm to improve the accuracy of its positioning.*
Accumulator	**is essentially a pressure storage reservoir in which a noncompressible hydraulic fluid is retained under pressure from an external source.** *Robots in manufacturing are often equipped with an accumulator to store energy, ensuring a continuous power supply during peak operational demands.*
Actuator	**a device that causes a machine or other device to operate.** *The actuator in the robotic arm precisely controls its movements, allowing it to pick up and manipulate objects with accuracy and efficiency.*
Automation	**the use of machines and computers that can operate without needing human control.** *Automation and robotics have decreased the need for a large, highly skilled work force.*
Automation technology	**Automation technology comprises all processes and work equipment that enable plants and systems to run automatically. These include machines, apparatus, equipment and other devices. Human intervention is minimal.** *Automation technology has transformed the manufacturing industry, increasing efficiency and productivity.* *Companies are investing in automation technology to streamline processes and reduce human error.*
Automated production lines	**are essentially advanced systems designed to streamline and optimize the manufacturing process. Generally, they utilize a combination of machinery, robotics, computer systems, and control software to automate various stages of production, reducing human intervention and increasing efficiency.** *The factory implemented automated production lines to increase efficiency and reduce labor costs.*
Artificial Intelligence	**the use or study of computer systems or machines that have some of the qualities that the human brain has, such as the ability to interpret and produce language in a way that seems human, recognize or create images, solve problems, and learn from data supplied to them.**

	Can artificial intelligence really create better art than a human artist? *Researchers have built an artificial intelligence model that can accurately identify cancer.*
Automatic control system	**is a system that can control the output quantity. Basically, it is a device or a set of the device which can manage, command, and regulate the operation of the other device or a system that uses control loops. (It used to carry out the instructions stored in the robot's memory).** *The automatic control system adjusts the temperature of the greenhouse based on real-time data.* *Modern cars are equipped with automatic control systems that regulate engine performance for optimal fuel efficiency.*
Barcode	**a printed series of parallel bars or lines of varying width that is used for entering data into a computer system. The bars are typically black on a white background, and their width and quantity vary according to application. The bars are used to represent the binary digits 0 and 1, sequences of which in turn can represent numbers from 0 to 9 and be processed by a digital computer. The presence or absence of a bar of a particular width in a particular position in a sequence is read by the computer as either a 0 or 1. Most such codes use bars of only two different widths (thick and thin), though some codes employ four widths. The numbers represented by a barcode are also printed out at its base.** *Barcode technology is used extensively in retail and logistics for inventory tracking and management.*
Breakthrough (n.) **Breakthrough (adj.)**	**an important discovery or event that helps to improve a situation or provide an answer to a problem;** *The technological breakthroughs and the process of globalization have produced new avenues for sustained economic growth.* *The company announced a breakthrough achievement in sustainable packaging.* **very important in the progress or development of something or someone, because of solving a big problem or making a big improvement.** *The article described the impact of their breakthrough discovery of the structure of DNA.* *The breakthrough research findings were published in a prestigious scientific journal.*
Classify	**to arrange by putting into groups according to some system.** *Machine learning algorithms can automatically classify images based on their content.*
Groundbreaking	**original and important; showing a new way of doing or thinking about things.** *This groundbreaking work changed the way historians looked at slavery.*
Efficient	**performing in the best possible manner with little time, money or energy wasted.** *Efficient use of resources is crucial for sustainable development.*

Energy	**the power from something such as electricity or oil, which can do work, such as providing light and heat. There are different types of energy: solar, nuclear, hydroelectric...** *Solar panels convert sunlight into energy to power homes and businesses.*
Feedback control	**is a control mechanism that uses information from measurements to manipulate a variable to achieve the desired result.** *The thermostat uses feedback control to maintain a constant temperature in the room.* *Feedback control systems are essential for stabilizing processes and maintaining desired conditions."*
Fumes	**strong, unpleasant and sometimes dangerous gas or smoke.** *The factory installed ventilation systems to extract harmful fumes from the production area.* *Exposure to vehicle exhaust fumes can have adverse effects on respiratory health.*
Hand of a robot	**is known as a gripper or end effector or end-of-arm tooling. It is the driven mechanical device(s) attached to the end of the manipulator.** *The robot's hand delicately grasped the fragile object without causing any damage.* *The robotic hand mimicked human movements with remarkable precision.*
Hydrogen	**a plentiful gas which has the potential to be used as fuel.** *Hydrogen fuel cells are being explored as a clean and sustainable energy source for vehicles.* *Hydrogen is the most abundant element in the universe.*
Industrial	**related to industry and the production of fuel, power and materials used to manufacture goods, esp. in factories.** *Industrial processes generate significant amounts of waste that need to be properly managed.* *The city's industrial sector plays a vital role in driving economic growth.*
Industrial robotics	**can be referred to as robotic arms which have sensors, and controllers that can perform various functions and operations in the manufacturing of producers in industries. They are programmed to operate repetitively in cycles.** *Industrial robotics has transformed manufacturing by automating repetitive tasks and increasing productivity.* *Companies are investing in industrial robotics to stay competitive in the global market.*
Industrial robot	**is defined as a number of rigid links connected by joints of different types that are controlled and monitored by computer.** *The industrial robot assembled car components with incredible speed and precision.* *An industrial robot was used to handle hazardous materials in the chemical plant.*
Innovation	**the creating and use of new ideas or methods.**

	The company prides itself on fostering a culture of innovation, constantly seeking new ideas and solutions. *Technological innovation drives progress and shapes the future.*
Intelligent automation (IA)	**or alternately intelligent process automation, is a software term that refers to a combination of artificial intelligence (AI) and robotic process automation (RPA).** *Intelligent automation combines artificial intelligence with automation technologies to optimize business processes.* *Companies are increasingly adopting intelligent automation to streamline operations and improve efficiency.*
Invention	**the action of inventing something, typically a process or device.** *The invention of the internet revolutionized communication and information exchange.* *Thomas Edison's inventions, such as the light bulb and phonograph, had a profound impact on society.*
Investment	**money or capital put into a business for profitable returns, e.g. interest or income.** *The government announced a significant investment in renewable energy infrastructure.* *Venture capitalists are interested in funding startups with promising technologies for a high return on investment.*
Links and Joints	**Links are the solid structural members of a robot, and joints are the movable couplings between them.** *The robotic arm's links and joints allowed it to move with flexibility and precision.* *Engineers studied the design of natural joints to improve the performance of robotic links and joints.*
Manual control device	**is used to teach the robot how to do a new task.** *The manual control device allowed operators to adjust the robot's movements with precision.* *In emergencies, the manual control device provides a backup option for overriding automated systems.*
Microprocessor	**is a component that performs the instructions and tasks involved in computer processing. In a computer system, the microprocessor is the central unit that executes and manages the logical instructions passed to it.** *The microprocessor is the brain of the computer, executing instructions and performing calculations.* *Advancements in microprocessor technology have led to smaller, faster, and more powerful computers.*
Multimedia computer system	**is one that can create, integrate, store, retrieve delete two or more types of media materials in digital form, such as audio, image, video, and text information.** *The multimedia computer system is equipped with speakers, a webcam, and a high-definition display for immersive audiovisual experiences.* *Students use multimedia computer systems to create interactive presentations with audio, video, and graphics.*
Nanosensors	**are nanoscale devices that measure physical quantities and convert these to signals that can be detected and analyzed.**

	Nanosensors detect and measure tiny changes in temperature, pressure, and chemical composition at the nanoscale. *Researchers are developing nanosensors for medical applications, such as detecting biomarkers for early disease diagnosis.*
Natural language processing (NLP)	**is the ability of a computer program to understand human language as it's spoken and written — referred to as natural language. It's a component of artificial intelligence (AI).** *Natural language processing enables computers to understand and generate human language.* *Virtual assistants like Siri and Alexa rely on natural language processing to respond to voice commands.*
Numerical control or computer numerical control (CNC)	**is a manufacturing method that automates the control, movement and precision of machine tools through the use of preprogrammed computer software, which is embedded inside the tools.** *CNC machines use numerical control to automate the manufacturing process, producing precise and consistent results.* *With the advent of computer numerical control, operators can program CNC machines to create complex shapes and designs.*
Pioneer (n.) **Pioneer (v.)**	**a person who is one of the first people to do something;** **develop or be the first to use or apply (a new method, area of knowledge, or activity).** *Marie Curie was a pioneer in the field of radioactivity. She won Nobel Prizes in both physics and chemistry.* *Steve Jobs was a pioneer of the personal computer revolution, co-founding Apple Inc. and introducing innovative products like the iPhone.* *The company pioneered the development of renewable energy technologies, paving the way for a sustainable future.* *Researchers are pioneering new methods for cancer treatment, pushing the boundaries of medical science.* *He pioneered in the use of ultra-high-frequency radio for field communications in the 1940s.* *The new method of cancer treatment was pioneered by an international team of researchers.*
Prototype **build/develop/create a prototype** **early/first/working prototype** **a prototype of/for something**	**the first example of something, such as a machine or other industrial product, from which all later forms are developed.** *Manufacturers have built a prototype which will be shown at the forthcoming trade fair.* *Our first prototype digital camera appeared back in 1976.* *The firm and its industrial partners plan this summer to put a prototype of an underwater power platform off the Florida coast.*

Robot	**is a computer-controlled machine that is programmed to move, manipulate objects, and accomplish work while interacting with its environment.** *Robots are increasingly used in warehouses for tasks such as picking and packing.*
Robot's memory	**holds a library of programs to use in executing different tasks.** *The robot's memory stored data about previous tasks, allowing it to learn and adapt its behaviour.* *By expanding the robot's memory capacity, engineers improved its ability to handle complex operations.*
Robot's speed of operation	**in performing a task should be at least equal to that of the human worker it is replacing.** *The robot's speed of operation was adjusted to meet the production demands of the factory.* *With advancements in technology, the robot's speed of operation has increased significantly.*
Robot's computer interface	**enables the robot to use the computer's larger memory to hold more task programs and to synchronize its actions with a complete production line of robots and other machines.** *Engineers developed a user-friendly robot's computer interface to facilitate programming and monitoring.* *Operators used the robot's computer interface to input commands and monitor its performance in real-time.*
Robotic programming	**is the process of defining specific commands of an application for an industrial robot to automate.** *The engineer specialized in robotic programming, writing code to control the robot's movements and tasks.* *Robotic programming involves defining sequences of actions for the robot to execute autonomously.*
Robotic process automation (RPA)	**is a form of business process automation that is based on software robots (bots) or artificial intelligence (AI) agents.** *Robotic process automation (RPA) software enables businesses to automate repetitive tasks previously performed by humans.* *With the implementation of robotic process automation (RPA), the company streamlined its invoicing process and reduced errors.*
COMPONENTS OF AN INDUSTRIAL ROBOT	
Mechanical Unit	**refers to the robot's manipulative arm and its base. Tooling such as end effectors, tool changers, and grippers are attached to the wrist-tooling interface. The mechanical unit consists of a fabricated structural frame with provisions for supporting mechanical linkage and joints, guides, actuators, control valves, limiting devices, and sensors. The physical dimensions, design, and loading capability of the robot depends upon the application requirements.** *The mechanical unit of the robot consists of gears, motors, and other components responsible for physical movement.*

	The mechanical unit of the engine underwent rigorous testing to ensure durability and efficiency.
Drive system	**is an important robot's component. It supplies the power, which enables the robot to move. Drive for a robot may be hydraulic, pneumatic, or electric. Hydraulic drives have been used for heavier lift systems. Pneumatic drives have been used for high speed, non-servo robots and are often used for powering tooling such as grippers. Electric drive systems can provide both lift and/or precision, depending on the motor and servo system selection and design. An AC or DC powered motor may be used depending on the system design and applications.** *The electric motor serves as the primary component of the drive system, providing power to propel the vehicle forward.* *The drive system of the conveyor belt efficiently transports goods along the assembly line.*
Control System	**Controller is the brain of the robot. Controller is a communication and information-processing device that initiates, terminates, and coordinates the motions and sequences of a robot. Most industrial robots incorporate computer or microprocessor-based controllers. These perform computational functions and interface with sensors, grippers, tooling, and other peripheral equipment.** **Controller programming may be done on-line or from off-line control stations. Programs may be on cassettes, floppy disks, internal drives, or in memory; and may be loaded or downloaded by cassettes, disks, or telephone modem. Some robot controllers have sufficient computational ability, memory capacity, and input/output capability to serve as system controllers for other equipment and processes.** *The control system regulates the robot's movements and coordinates its actions with precision.* *The thermostat's control system maintains the temperature of the room within a specified range.*
Tooling	**is manipulated by the robot to perform the functions required for the application. Depending on the application, the robot may have one functional capability, such as making spot welds or spray-painting. These capabilities may be integrated with the robot's mechanical system or may be attached at the robot's wrist-end effector interface. Alternatively, the robot may use multiple tools that may be changed manually (as part of set-up for a new program) or automatically during a work cycle.** **Tooling and objects that may be carried by a robot's gripper can significantly increase the envelope in which objects or humans may be struck. Tooling manipulated by the industrial robot and carried objects can cause more significant hazards than motion of the bare robotic system. The hazards added by the tooling should be addressed as part of the risk assessment.** *The CNC machine was equipped with specialized tooling to shape and carve intricate designs from metal.*

	The mechanic carefully selected the appropriate tooling to repair the damaged part of the engine.
Sensor	**is a device that produces a signal for purposes of detecting or measuring a property, such as position, force, torque, pressure, temperature, humidity, speed, vibration, etc.** **Sensors are used to collect information about the internal state of the robot or to communicate with the outside environment. Sensors integrated into the robot send information about each joint or link to the controller, which determines the configuration of the robot. Robots are often equipped with *external sensory devices* such as a vision system, touch and tactile sensors, speech synthesizers, etc., which enable the robot to communicate with the outside world.**
SENSOR TERMINOLOGY	
Sensitivity of a sensor	**is defined as the change in output of the sensor per unit change in the parameter being measured. The factor may be constant over the range of the sensor (linear), or it may vary (nonlinear).** *The sensitivity of a sensor determines its ability to detect small changes in the measured parameter.* *Engineers improved the sensitivity of the sensor to accurately monitor slight variations in temperature.*
Range	**Every sensor is designed to work over a specified range. The design ranges are usually fixed, and, if exceeded, result in permanent damage to or destruction of a sensor. Range is the difference between maximum and minimum values of the applied parameter that can be measured.** *The range of the sensor defines the maximum and minimum values it can measure.* *This thermometer has a range of -50°C to 150°C, making it suitable for various applications.*
Precision	**is the degree of reproducibility of the measurements.** *The precision of the measurement instrument is crucial for scientific experiments that require exact data.* *High precision tools are necessary for manufacturing components that need to fit together perfectly.*
Resolution	**is defined as the smallest change that can be detected by a sensor. In other words, it is the response of the measuring instrument for small variations in the input parameter.** *The resolution of a digital camera refers to the smallest detail it can capture.* *In microscopy, higher resolution allows scientists to observe finer details of microscopic organisms.*
Accuracy	**A very important characteristic of a sensor is accuracy, which really means inaccuracy. Inaccuracy is measured as a ratio of the highest deviation of a value represented by the sensor to the ideal value. It may be represented in terms of measured value.**

	The accuracy of the GPS system ensures that users can navigate to their destinations without errors. *Calibration improved the accuracy of the scale, ensuring precise weight measurements.*
Hysteresis	**is the difference in response for increasing and decreasing values of the applied parameter.** *Hysteresis in the sensor's readings caused discrepancies when the same pressure was applied repeatedly.* *Minimizing hysteresis is important for sensors used in applications where consistent measurements are critical.*
Response time	**The time taken by a sensor to approach its true output when subjected to a step input is sometimes referred to as its response time.** *The response time of the sensor is crucial in safety systems where immediate detection of hazards is required.* *Fast response time is essential for sensors in automated machinery to promptly react to changes in conditions.*
Offset	**is the sensor output that exists when it should be zero.** *An offset error was observed in the sensor readings, requiring adjustment to ensure accurate measurements.* *Calibration helps to correct any offset present in measurement instruments.*
Linearity error	**It is defined as an expression of the extent to which the measured curve departs from the ideal theoretical curve.** *The linearity error of a sensor can affect its performance, especially in applications requiring high accuracy over a wide range.* *Compensating for linearity error is essential for ensuring the reliability of measurement systems.*
Span	**is defined as the range of measured variable for which an instrument is designed to measure with full linearity.** *The span of a sensor is the difference between its maximum and minimum measurable values.* *Adjusting the span of the sensor allows it to measure a wider range of pressures.*
Calibration	**is defined as the comparison of specific values of the input and output of an instrument with the corresponding reference standard values.** *Regular calibration of instruments is necessary to maintain their accuracy and reliability.* *The technician performed calibration on the temperature sensor to ensure it provided correct readings.*
SENSOR CLASSIFICATION	
Temperature sensors:	thermometers, thermocouples, thermistors
Heat sensors:	calorimeter
Electromagnetic sensors. For measuring voltage, current, charge, magnetic field, flux, and permeability.	

Electrical resistance sensors:	ohmmeter, multimeter
Electrical current sensors:	galvanometer, ammeter
Electrical voltage sensors:	voltmeter
Electrical power sensors:	watt-hour meters
Magnetism sensors:	magnetic compass, magnetometer, Hall effect device
Mechanical sensors. For measuring quantities such as position, shape, velocity, force, torque, pressure, strain, and mass.	
Pressure sensors:	barometer, barograph, pressure gauge, air speed indicator**.**
Gas and liquid flow sensors:	flow sensor, flow meter, gas meter, water meter.
Chemical sensors	Ion-selective electrodes, pH glass electrodes.
Optical and radiation sensors	Bubble chamber, dosimeter. Photocells, photodiodes, phototransistors, photoelectric tubes.
Acoustic sensors **Sound sensors:**	microphones, hydrophones, seismometers. **A sound sensor is a device that can convert sound signals into electrical signals or vice versa. In the former case, they are called input sound sensors, and microphones are an example of this. In the latter case, they are called output sound sensors, speakers being an example.**
Telecommute	**to work at home and communicate with your office by phone or email.** *Last year, 9.3 million Americans telecommuted at least one day per week.* *Many employees were given the option to telecommute, allowing them to work from home several days a week.* *Advancements in technology have made it easier for professionals to telecommute, reducing the need for daily commutes.*
Teleoperator	**a robotic device controlled from a distance by a human operator: usually used to provide safety for the operator, as in working with radioactive materials.** *The teleoperator controlled the robotic arm remotely to perform delicate tasks in a hazardous environment.* *Using advanced teleoperator systems, surgeons can conduct remote surgeries with precision.*
Videoconferencing	**a system with video cameras connected by the internet or by a special connection so that people in different places can see and communicate with each other, so they do not have to travel to meetings.** *The team held a videoconferencing meeting to discuss the project updates with colleagues in different locations.* *Videoconferencing has become an essential tool for businesses to maintain communication with remote workers.*
Work envelope/Workspace	**A robot can only work in the area in which it can move. This area is called the work envelope. The work envelope is determined by how far the robot's arm can reach and how flexible the robot is.**

	The more reach and flexibility a robot has, the larger the work envelope will be. It is one of the most important characteristics to be considered in selecting a suitable robot. *The robot's work envelope defines the area within which it can move and operate effectively.* *Designing an efficient workspace is crucial for maximizing productivity and minimizing fatigue.*
Wrist of the robot	**is used to aim the hand at any part of the work piece. The wrist may have three motions: pitch (up-and-down motion), yaw (side-to-side motion), and roll (rotating motion).** *The wrist of the robot is designed to rotate and tilt, allowing for greater flexibility in handling tasks.* *Engineers enhanced the wrist of the robot to improve its precision in assembling small components.*

LANGUAGE PROFICIENCY FOR EFFECTIVE AUTOMATION TECHNOLOGY

When discussing automation technology, language competence refers to the capacity to comprehend and make efficient use of a variety of programming languages, frameworks, and tools. The ability to develop, build, and maintain automated systems requires knowledge of these languages as automation technology grows more sophisticated and pervasive in contemporary businesses.

ADVANCED LANGUAGE SKILLS FOR SUCCESSFUL AUTOMATION TECHNOLOGY

Beyond typical programming languages, automation technology professionals might also be proficient in other languages. It encompasses the capacity to comprehend and communicate in human languages in order to promote cross-border cooperation, boost user satisfaction, and improve automated systems' performance in a global setting. Understanding the value of foreign language competency, how it affects different areas of automation technology, and practical methods for utilizing this competency are essential for making the right decisions at all levels of the product development and production process as well.

The importance of foreign language proficiency in automation is obvious.

As various automation projects presuppose global collaboration and often involve teams from different countries, the ability to understand and communicate foreign languages is obligatory. Proficiency in multiple languages fosters better communication, reduces misunderstandings, and enhances teamwork.

As for the user experience concerned, multilingual support is a must for automated systems intended for a worldwide user base. This guarantees usability and accessibility for a great number of people who do not understand the particular language.

Knowing the language is a great advantage for market expansion. By localizing their automated goods and services, businesses may reach a wider audience and penetrate new markets.

Cultural understanding seems also to be essential. Being able to communicate in a language helps one grasp cultural quirks, which is important for creating automated systems that are sensitive to cultural differences.

Training and support should be paid a great attention to. Providing multilingual training and resources enhances automation technology uptake and efficacy.

KEY AREAS OF IMPACT

1. Documentation and Training	2. User Interfaces
- Multilingual Documentation: By making user manuals, user guides, and technical material available in a variety of languages, users from all over the world may successfully comprehend and operate automated systems. - Training Materials: Creating training materials and programs in several languages improves information transfer and the learning process.	Creating user interfaces that are multilingual will increase user satisfaction and accessibility. Changing user interface material to match the language and cultural norms of several locales.
3. Natural Language Processing (NLP)	**4. Customer Support**
- Multilingual NLP Models: Intelligent, language-agnostic automated systems need the	- Multilingual Support Systems: Putting in place chatbots and other automated systems that

development of NLP models that comprehend and process various languages. - Speech recognition: Accurately identifying and interpreting many languages by training speech recognition systems.	can converse in several languages for customer service. - Global Customer Service: Assisting clients in their mother tongues.
5. Collaboration and Team Communication*	
- International Teams: Encouraging common language usage across international teams to promote communication and teamwork. - Cross-Border Projects: Overcoming linguistic obstacles to effectively manage automation projects that span borders.	

DESCRIBING STRATEGIES FOR LEVERAGING FOREIGN LANGUAGE PROFICIENCY IN AUTOMATION TECHNOLOGY

1. To fully utilize foreign language skills in automation technology, two associated techniques are necessary: ***localization and internationalization***.

Localization entails modifying features and content to accommodate users' language and cultural preferences in certain areas. It includes a number of elements: legal and regulatory compliance, regional formats, cultural adaptation, and language translation.

- Language Translation means translating user interfaces, documentation, and support materials into the target language. This entails making sure that colloquial phrases, regional terminology, and cultural subtleties are appropriately conveyed in addition to the written material.
- Cultural adaptation is the process of changing material to take into account regional values, practices, and cultural sensitivity. Images, symbols, and colors, for instance, that are acceptable in one culture may not be in another.
- Regional Formats: Adapting numerical, date, time, and currency formats to match local conventions. For instance, date formats differ between the US (MM/DD/YYYY) and Europe (DD/MM/YYYY).
- Legal and Regulatory Compliance: Ensuring that automated systems abide by regional rules and regulations. This may include offering interfaces and documentation in the official language or languages of the area.

The process of creating systems that are adaptable enough to accommodate many languages and regional preferences right from the start is known as ***internationalization***.

2. Language Translation Technologies

The potential to use foreign language skills in automation technology may be greatly increased by the effective use of language translation systems. There are two main methods: ***machine translation and human translation.***

The advantage of machine translation is rapid and effective text translation via the use of automated techniques. Neural Machine Translation (NMT) increases translation accuracy and fluency as NMT systems employ deep learning techniques. These algorithms are better able to handle complicated language structures and learn from large datasets.

Human translation involves hiring qualified translators to provide accurate translations of important documents and user interfaces.

Expert Translation Services: Human translators can give a degree of accuracy and cultural sensitivity that machine translation cannot for highly specialized or sensitive topics. This is especially crucial for marketing brochures, technical manuals, and legal papers.

3. Cultural Sensitivity Training

Fostering an inclusive workplace and improving the performance of international teams and products need cultural sensitivity training.

A wide range of cross-cultural training programs offer staff members instructions to increase their comprehension of other cultures, communication emphases, and commercial procedures. This enhances teamwork, fosters empathy, and reduces cultural misunderstandings.

Arranged by cultural specialists workshops and seminars inform teams about the subtle cultural differences in target markets. Among the topics suggested for acquaintance and studying are social conventions, corporate procedure, cultural etiquette, etc.

Cultural awareness in design is aimed at encouraging developers to consider cultural differences when creating user interfaces and experiences. This entails being aware of iconography, color symbolism, and text that may have diverse cultural connotations.

To optimize the use of foreign language competence in automation technologies, a blend of tactics that improve user experience, communication, and market penetration is required. System adaptability and relevance to a range of audiences are guaranteed by localization and internationalization. Intelligent and responsive automated systems are made possible by multilingual NLP and AI models. Simultaneously, language translation technologies offer effective methods for managing multilingual information. Training in cultural awareness promotes inclusivity, and multilingual customer service guarantees excellent assistance for a worldwide audience. Implementing these tactics and strategies organizations are able to develop reliable and approachable automation solutions that flourish in a globalized society.

THE CRUCIAL ROLE OF LANGUAGE COMPETENCES IN AUTOMATION TECHNOLOGY

Language competencies are essential for the field of automation technology. These competencies go beyond the technical jargon of programming languages and include the ability for successful communication in human languages. With the increasing advancement of automation technology and its integration into a great variety of businesses globally, there is a strong demand for experts with good language abilities. These skills are necessary not just for developing and comprehending code but also for facilitating efficient cooperation, transparent communication, and the smooth integration of automated systems into international marketplaces.

Language competencies in the context of automation technology may be divided into two primary categories: foreign language proficiency and technical language proficiency.

On the one hand, foreign language competency entails the ability to communicate in numerous human languages, which is essential for understanding a wide range of user demands, servicing worldwide clients, and working in multinational teams.

Proficiency in technical language, on the other hand, includes knowledge of programming languages, technical jargon, and the capacity to create accurate and understandable technical documentation.

Nowadays due to the computer industry's growing globalization, projects frequently traverse national borders and cultural boundaries. Therefore, in order to guarantee the success of their projects, engineers, developers, and other experts need to be skilled in navigating linguistic and cultural

differences. The ability to interact with team members and stakeholders from diverse linguistic backgrounds, read and understand technical materials published in a variety of languages, and create user interfaces and documentation that are accessible to a worldwide audience are conditions required from all these specialists.

Furthermore, the significance of linguistic competencies has been emphasized by the development of such advanced automation technologies as artificial intelligence (AI) and natural language processing (NLP). Because of the heavy reliance of these technologies on the processing, comprehension, and generating a human language, competence in both technical and human languages is vital for professionals operating in these fields.

Thus, proficient language skills in automation technology are a cornerstone of efficient communication, teamwork, creativity and innovation. Professionals may advance technological developments, and contribute to the creation of reliable and user-friendly automated systems by improving their proficiency in both technical and foreign languages.

ENHANCING GRAMMAR, VOCABULARY, SPEAKING, AND READING SKILLS IN A FOREIGN LANGUAGE (ENGLISH) FOR EFFECTIVE APPLICATION IN AUTOMATION TECHNOLOGY

Mastery of the English language, particularly in the realms of grammar, vocabulary, speaking, and reading, is crucial for professionals in automation technology. English is the dominant language in global business, technology, and scientific communities, making proficiency in it essential for communication, collaboration, and innovation.

1. Grammar. Importance of Correct Grammar in Automation Technology

Grammar Competence is defined as the ability to use language correctly and appropriately in both written and spoken forms. It includes knowledge of syntax (sentence structure), morphology (word formation), semantics (meaning), and punctuation. For automation technology specialists, grammar competence is essential for several reasons.

Clear Communication

Use of proper grammar guarantees accurate and concise communication. Proper language avoids misunderstandings and mistakes in automation technology, where documentation and all instructions must be exact and clear.

Documentation: Project reports, technical specifications, user manuals, and other documents are frequently needed for automation projects. All parties involved, including non-native speakers, may readily understand the material when it is documented in a clear and grammatically accurate manner.

Code Comments: Adding clear notes to the code makes it easier for other developers to comprehend its function and goal, which, in its turn, promotes improved maintenance and cooperation.

Emails and Reports:	Professionals must use emails and reports to communicate with stakeholders, clients, and other co-workers. These conversations will be professional, successful and straightforward in case they use proper language.
Professionalism and Credibility	Correct grammar conveys professionalism and attention to detail. It facilitates making a good impression on stakeholders, clients, and coworkers. In professional interactions and partnerships, trust and credibility are built via clear and grammatically accurate communication.
	Technical Precision
Accurate Instructions:	Exact instructions are essential for automation technologies. When implementing automated systems, grammatical flaws might cause misunderstandings and mistakes.
Standardization:	Maintaining standards in documentation and communication is made easier by using language consistently. It is crucial for compliance and quality control.
	International Cooperation
Multinational Teams:	Teams from many countries frequently participate in automation initiatives. Regardless of a team member's mother tongue, good communication that is grammatically sound guarantees that everyone can comprehend and participate.
Client Interactions:	Working with clients and partners throughout the world is a common requirement for professionals. Building professional connections and communicating clearly both depend on using proper language.
	Education and Development
Continuous Learning:	Good grammar is necessary for reading research papers, technical documents, and keeping up with industry developments. A strong command of grammar facilitates understanding of difficult topics.
Information sharing:	Posting tutorials, blogs, and articles that share information can aid members of the community. The usefulness and accessibility of the shared knowledge are guaranteed by proper grammar.

COMMON GRAMMAR MISTAKES IN TECHNICAL ENGLISH AND HOW TO AVOID THEM

Technical writing, which is distinguished by its clarity and precision, is crucial in domains such as software development, engineering, and automation technology. Even seasoned professionals, are susceptible to basic language faults that result in misinterpretations and inaccuracies. Below you will find some of the most common grammatical mistakes made in technical writing and some helpful tips for avoiding them.

1. Subject-Verb Agreement Errors

Mistake: Misalignment between the subject and verb in a sentence.

Incorrect: *"The list of requirements need to be updated."*
Correct: *"The list of requirements needs to be updated."*

Explanation: In this example, "list" is the subject, which is singular. Therefore, the verb should also be singular ("needs").
How to Avoid: - Identify the true subject of the sentence, ignoring intervening phrases.
- Ensure the verb agrees with the singular or plural form of the subject.

2. Misplaced Modifiers

Mistake: Placing a descriptive word or phrase too far from the word it modifies.

Incorrect: "The technician fixed the error that was discovered in the program quickly."
Correct: "The technician quickly fixed the error that was discovered in the program."

Explanation: The adverb "quickly" should be placed next to the verb it modifies ("fixed") to clarify that the fixing was done quickly.
How to Avoid: - Place modifiers as close as possible to the words they are intended to modify.
- Re-read sentences to ensure the modifier placement does not alter the intended meaning.

3. Run-On Sentences and Comma Splices

Mistake: Joining two independent clauses without proper punctuation or conjunction.

Incorrect: "The server crashed, we lost all the data."
Correct: "The server crashed, and we lost all the data." or "The server crashed. We lost all the data."

Explanation: Two independent clauses cannot be joined by a comma alone. They require a conjunction or a semicolon.
How to Avoid: - Use a conjunction (and, but, or) to join independent clauses.
- Use a period to separate independent clauses into distinct sentences.
- Use a semicolon to join closely related independent clauses.

4. Incorrect Use of Articles

Mistake: Misuse or omission of definite and indefinite articles ("the," "a," "an").

Incorrect: "Programmer wrote code."
Correct: "The programmer wrote the code."
Explanation: Articles provide clarity about whether something is specific or general.
How to Avoid: - Use "the" for specific items known to the reader.
- Use "a" or "an" for non-specific items or the first mention of something.

5. Tense Inconsistencies

Mistake: Shifting tenses inappropriately within a sentence or paragraph.

Incorrect: “The software was installed yesterday and runs perfectly today.”
Correct: “The software was installed yesterday and has been running perfectly today.”

Explanation: Maintain consistent tense unless there is a clear reason to shift (e.g., indicating a change in time frame).
How to Avoid: - Review sentences for consistent tense usage.
- Ensure that any tense changes are logical and necessary for the context.

6. Pronoun-Antecedent Agreement

Mistake: Mismatch between pronouns and their antecedents in number and gender.

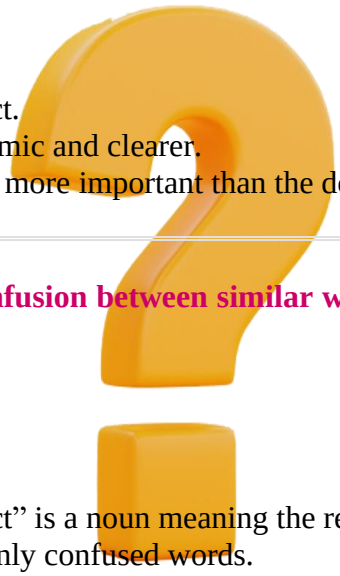
Incorrect: “Each engineer must submit their report by Friday.”
Correct: “Each engineer must submit his or her report by Friday.” or “All engineers must submit their reports by Friday.”

Explanation: “Each engineer” is singular, so the pronoun should also be singular (“his or her”).
How to Avoid: - Ensure pronouns agree with their antecedents in number and gender.
- Rephrase sentences to avoid awkward constructions.

7. Overuse of Passive Voice

Mistake: Over-relying on the passive voice, leading to vagueness or lack of clarity.

Incorrect: “The error was fixed by the developer.”
Correct: “The developer fixed the error.”



Explanation: Active voice makes sentences clearer and more direct.
How to Avoid: - Prefer active voice to make sentences more dynamic and clearer.
- Use passive voice judiciously when the action's receiver is more important than the doer.

8. Incorrect Word Usage

Mistake: Using incorrect or imprecise words, often due to confusion between similar words (e.g., affect/effect, its/it's).

Incorrect: “The changes will effect the system's performance.”
Correct: “The changes will affect the system's performance.”

Explanation: “Affect” is a verb meaning to influence, while “effect” is a noun meaning the result.
How to Avoid: - Learn the meanings and correct usage of commonly confused words.
- Consult dictionaries or style guides when unsure.

9. Lack of Parallel Structure

Mistake: Failing to use a consistent structure in a series or list.

Incorrect: “The system is efficient, reliable, and it is easy to use.”
Correct: “The system is efficient, reliable, and easy to use.”

Explanation: Parallel structure enhances readability and clarity by maintaining a consistent pattern.
How to Avoid: - Use the same grammatical form for elements in a series or list.
- Review lists and series to ensure consistency.

10. Punctuation Errors

Mistake: Misuse of punctuation marks, such as commas, semicolons, and apostrophes.

Incorrect: "The server, which was recently upgraded crashed."
Correct: "The server, which was recently upgraded, crashed."

Explanation: Commas should correctly set off non-essential clauses.
How to Avoid: - Familiarize yourself with punctuation rules.
- Proofread carefully to check for proper punctuation usage.

Professionals may guarantee their technical writing and communication are efficient and professional by being aware of these common mistakes and using preventative measures.

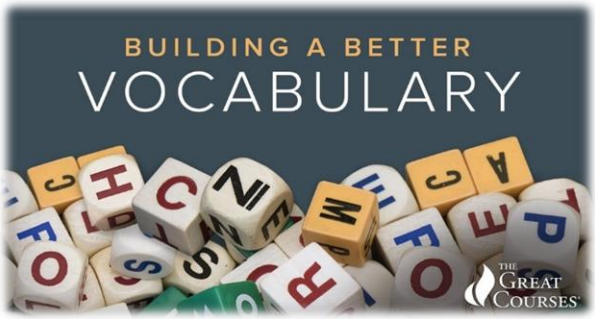
Improving grammar is important for clear and effective communication. This is especially true in technological sectors.

STRATEGIES TO IMPROVE GRAMMAR

Regular Reading	Read various publications, including books, papers, journals, blogs, and technical manuals. As a result, you will be exposed to proper grammar usage in many situations. Take into account a word choice, phrase construction, and punctuation. Examine the way in which skilled writers build sentences and effectively communicate their thoughts.
Writing Practice	Schedule time each day for writing. This might be diary entries or technical documents. Regular practice helps reinforce grammar rules. Ask friends or coworkers to read your writing and provide criticism. Constructive criticism might draw attention to areas that require improvement.
Grammar Resources	Consult grammar books such "English Grammar in Use" Raymond Murphy or "Oxford Practice Grammar" by John Eastwood. For more grammatical rules, exercises, and advice, visit websites such as Grammarly and Cambridge English.
Grammar Check Tools	Make use of grammar checkers such as Hemingway and Grammarly. These resources point out grammatical errors and provide correction advice.
Grammar Tests	To gauge your improvement, take grammar examinations on a regular basis. Numerous websites provide free grammar tests and quizzes.
Track Progress	Record your mistakes and progress in a diary. Reflecting on your progress might help you maintain motivation and focus.

Improving grammar requires constant practice and effort. You can greatly improve your grammar by combining reading, writing, and the use of different educational materials and tools. This enhances not just your ability to communicate but also your professionalism and efficacy in the technical domain. The secret to mastering grammar is to regularly evaluate yourself and to be open to learning and change.

2. Understanding Vocabulary Competence and Its Importance for Automation Technology Specialists



The term “vocabulary competency” describes the ability to comprehend and apply a broad spectrum of terminology, both general and industry-specific. Vocabulary proficiency is essential for automation technology professionals for a number of reasons, including clear communication, effective problem-solving, and ongoing professional growth.

	Technical Communication
Precise Terminology	Automation technology is abounded in specialized terms. Specialized vocabulary includes terminology related to programming, systems architecture, hardware, and software. Experts that possess a strong vocabulary are able to precisely explain procedures, instruments, components and parts as well as various processes. For instance, it is necessary to comprehend the distinction between "actuators" and "sensors" in order to develop and discuss automation systems. Rich vocabulary allows for more effective and nuanced communication. It is particularly important for discussions, presentations, and negotiations where precise language can convey complex ideas clearly.
Documentation	It takes a good knowledge of pertinent terminology to create clear documentation (user manuals, technical specifications, and code comments).
Error Reporting	Communicating errors and issues effectively to colleagues or support teams relies on precise vocabulary. The troubleshooting process can be streamlined by differentiating between a "bug" and a "feature request".
	Collaboration and Teamwork
Multinational Teams	Automation projects often involve international teams. A shared technical vocabulary ensures smooth collaboration and minimizes misunderstandings.
Cross-Disciplinary Communication	Experts in one discipline must frequently communicate with experts in other fields (e.g., electrical engineers, software developers, data scientists). Proficiency in language facilitates successful cross-disciplinary communication.
	Professional Development
Learning New Technologies	Automation is a quickly developing sector where new techniques and technology are always being developed. Experts with strong vocabulary find it easier to comprehend and use these advancements.

Industry Literature	A firm command of technical vocabulary is obligatory for reading and understanding books, articles, and papers written for the industry. Researching developments in “cyber-physical systems” or “AI-driven automation” requires a thorough grasp of technical terms.
Certifications and Training	The curriculum of many professional certification and training courses includes technical vocabulary. Mastery of the specialized vocabulary is compulsory for passing exams and obtaining certifications.
	Problem Solving and Innovation
Diagnostic Skills	Effective troubleshooting and problem-solving greatly depend on the problem accurate identification with correct characterization and description. Understanding the concepts “failure mode,” “root cause analysis," and "fault detection" together with their correct usage will help to identify and fix system problems.

STRATEGIES TO ENHANCE VOCABULARY COMPETENCE

Extensive Reading	Regularly read technical journals, research papers, and industry publications. Study manuals specific to automation technology and related fields.
Vocabulary Building Tools (flashcards, applications)	Use flashcards to memorize and review technical terms. Make use of vocabulary-building apps like Anki or Quizlet. They will enable you customize your study sessions.
Active Use and Practice	Write technical documents, reports to practice using new vocabulary. Engage in discussions and presentations using technical terms to reinforce your vocabulary. Join professional forums and online groups to discuss automation topics.
Lifelong Learning	Attend workshops, seminars, and conferences to hear and learn the latest industry terminology.

For automation technology experts, vocabulary competence is a fundamental ability that supports efficient communication, teamwork, problem-solving, and lifelong learning. Professionals can better manage the complexity of their field, contribute to projects more efficiently, and keep up with technical changes by increasing and improving their vocabulary. Key tactics for improving language competency include consistent practice, use of instructional materials, and involvement in professional groups.

VOCABULARY DEVELOPMENT EXERCISES FOR AUTOMATION-RELATED TERMINOLOGY

Effective vocabulary development is vital for learning technical terminology and improving communication skills. One of the most successful methods to accomplish this is through interesting and practical exercises that not only teach new words but also assure their proper use in context. Here you can find a variety of vocabulary development exercises that aim to increase learners' comprehension and application of technical terms. These exercises, which include contextual learning, analyzing word families, and examining synonyms and antonyms, seek to give a complete approach to vocabulary development, ensuring that learners can speak more clearly and confidently in professional settings.

Example Tasks:

Match Vocabulary Words with Their Definitions Based on Context:

Task: Provide a list of automation-related terms along with a set of definitions. Ask students to match each word with its correct definition based on how they are used in context.

Example:

Term:	***Definition:***
HMI (Human-Machine Interface)	*A user interface that connects an operator to the controller for an industrial system.*

Contextual Sentence Writing (Use new vocabulary in context to reinforce understanding)

Task: Provide a list of new terms. Ask students to write sentences using each term in a relevant context. Discuss the sentences to ensure correct usage.

Example:

Term: "Latency"

Sentence: Reducing latency is crucial for real-time data processing in automation systems.

Understanding Related Words and Their Usage: Identify and Use Different Forms of a Word

Task: Provide a base word and ask students to identify and use its different forms in sentences.

Example:

Base word: automate
Forms: automation, automated, automating

1. The _____ (automation) of routine tasks has freed up employees to focus on more complex issues.
2. Many industries have adopted _____ (automated) systems to increase efficiency.
3. The company is currently _____ (automating) its customer service processes to provide faster responses.

Base word: innovate
Forms: innovation, innovative, innovator

1. The tech startup is known for its cutting-edge _____ (innovation) in artificial intelligence.
2. Adopting an _____ (innovative) approach can help companies stay ahead in the market.
3. She is considered an _____ (innovator) in the field of renewable energy.

Create Sentences Using Words from the Same Family

Example:
Words: optimize, optimization, optimal

1. To _____ (optimize) the workflow, the manager introduced new project management software.
2. The team focused on the _____ (optimization) of resources to maximize productivity.
3. Achieving an _____ (optimal) balance between work and rest is crucial for employee well-being.

Words: mechanize, mechanization, mechanical

1. The decision to _____ (mechanize) the agricultural process led to increased yields.
2. The _____ (mechanization) of factories in the early 20th century revolutionized production.
3. He studied _____ (mechanical) engineering to design more efficient machines.

Fill in the Blanks in Sentences with Appropriate Vocabulary Words

Example
Vocabulary Words: automation, efficiency, robotics, innovation, productivity

1. The implementation of _____ in the manufacturing process has significantly reduced labor costs.
2. Advances in _____ have led to the development of more sophisticated industrial robots.
3. To maintain a competitive edge, companies must continuously seek _____ in their operations.
4. The use of _____ in production lines has improved overall _____ by minimizing human error.
5. By integrating _____ technologies, businesses can enhance their operational _____ and output.

Crossword Puzzles and Word Searches

Task: - Create crossword puzzles or word searches using automation terminology.
- Provide clues related to the definitions or use cases of the terms.
- Have learners complete the puzzles individually or in groups.

Example:
- Clue: "System used for monitoring and controlling industrial processes" (Answer: SCADA).

By completing these exercises, students will enhance their vocabulary related to automation technology and develop a deeper understanding of word families and their usage.

3. Developing Reading Skills: Techniques for Effective Reading Comprehension in Automation Technology

In the rapidly evolving field of automation technology, staying updated with the latest advancements, trends, and research is crucial for professionals and students alike. Developing effective reading skills is essential for comprehending complex technical documents, academic papers, and industry reports. By enhancing your ability to read and comprehend business English, you improve not only your individual performance but also contribute to the overall success of your organization.

Importance of Reading Skills in Automation Technology

Understanding Complex Concepts	Automation technology includes complex ideas like robotics, artificial intelligence, and control systems. Individuals with strong reading abilities are better equipped to understand these difficult concepts.
Staying Updated	The field is constantly evolving. Regularly reading journals, papers, and industry news helps professionals remain up to date on new advances.
Professional Growth	Improved reading comprehension leads to superior problem-solving skills, informed decision-making, and overall professional competency in automation technology.

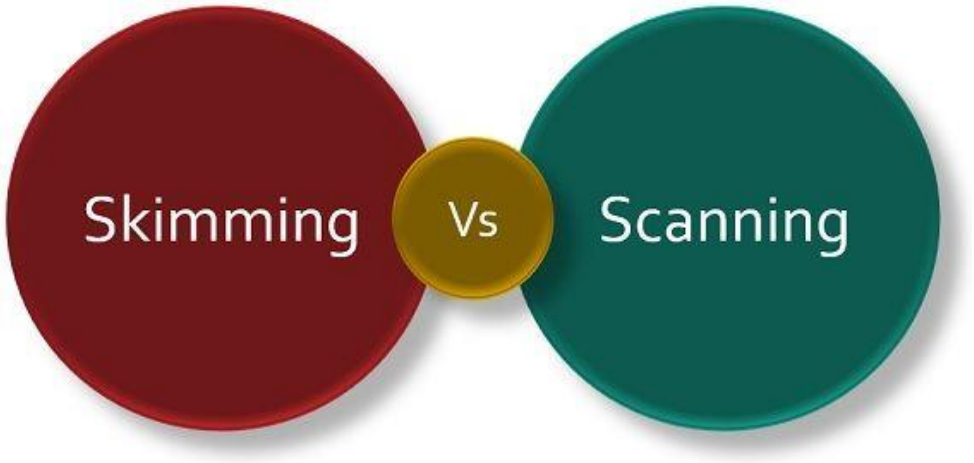
KEY TECHNIQUES FOR IMPROVING READING SKILLS FOR ESL STUDENTS

Improving reading skills is fundamental for ESL students since it adds to their overall language fluency and academic performance. Here's a comprehensive description of major practices that might help ESL students improve their reading skills.

	Building Vocabulary
Flashcards	Create flashcards with new vocabulary words on one side and their meanings, along with example sentences, on the other. Regular review of these flashcards can help reinforce memory and aid in retention.
Word Lists	Maintain a separate notepad or digital document to record new terms found while reading. Include the definitions, parts of speech, and sample sentences.
Context Clues	Use context cues to deduce the meanings of unknown terms. Look at the phrases around the new word for clues to its meaning.
	Active Reading Strategies
Highlighting and underlining	Use different colors to emphasize or underline important information, significant concepts, and new terminology. This visual difference aids in quick finding key sections of the text.

Annotating	Make notes in the margins to summarize passages, note down questions, or draw personal connections to the material. This participatory technique engages readers and improves understanding.
Summarizing	After reading a section, provide a brief summary in your own words. This technique helps to reinforce information and ensure that the major elements are understood.

Skimming and Scanning	
Skimming	Read the material quickly to obtain a general sense of its content. Concentrate on the titles, headers, subheadings, introduction paragraphs, and closing phrases. This strategy is good for obtaining the idea without going into depth.
Scanning	Search for particular information or keywords in the text. This strategy is useful for finding answers to specific inquiries or data points.



Skimming and scanning are two essential reading techniques that serve different purposes in efficiently extracting information from a text. Both methods are especially useful for students, researchers, and professionals who need to manage large volumes of information quickly.

Skimming Purposes	
Getting the Gist of the Text	Skimming is used to gain a general overview or the major points of a material without reading it thoroughly. This helps you determine whether the material is relevant to your needs.
Previewing Material	Skimming helps you to get a quick overview of the information before diving deeper. It helps in understanding the structure and main ideas of the text.
Identifying Structure and Organization	This approach assists in detecting how the text is arranged (such as headers, subheadings, bullet points, and other structural elements).
Quick Decision Making	Skimming might help you decide whether the content is worth reading in depth. It is especially beneficial when working with big amounts of content or when time is restricted.

How to Skim:

- Read titles, headings, and subheadings.
- Look at any graphics, charts, or pictures, and read their captions.
- Read the first and last paragraphs.
- Read the first sentence of each paragraph.
- Look for keywords and phrases that stand out.

Scanning Purposes

Locating Specific Information	Scanning is used to find specific facts, dates, statistics, or pieces of information within a text. This is useful when you need to find certain information without reading the complete text.
Answering Specific Questions	When you have specific questions in mind, scanning can help you quickly find the answers by searching for relevant keywords or phrases.
Efficient Data Extraction	Scanning is efficient for extracting data such as names, numbers, or technical terms from a large body of text.
Navigating Documents	It facilitates the rapid discovery of relevant sections or items in documents like reports, manuals, or databases.
Time Management	Scanning saves time by allowing you to skip irrelevant information and focus directly on what you need to find.

How to Scan:

- Identify the specific information you are looking for.
- Use headings and subheadings as guides to sections of the text that are likely to contain the information.
- Look for keywords or phrases related to the information you need.
- Pay attention to typographical cues such as bold or italic text, bullet points, and numbers.
- Move your eyes quickly down the page until you locate the desired information.

By mastering skimming and scanning techniques, readers can effectively manage their reading tasks, making it easier to handle extensive materials and find pertinent information swiftly. These techniques are invaluable for academic studies, research, and professional work, where efficient information processing is crucial.

	Using Graphic Organizers
Mind Maps	Make mind maps to graphically organize knowledge and highlight the links between concepts. This can help you grasp difficult ideas and remember information.
Flowcharts	Use flowcharts to depict the processes or sequences stated in the text. This is very beneficial for comprehending the phases or stages of a process.
	Developing Reading Comprehension Skills
Predicting	Before reading, make assumptions about the content based on its title, headers, and any available illustrations. This provides a reason for reading and utilizes past knowledge.
Questioning	Create questions before, during, and after reading to be involved and assure understanding. These questions can be regarding the main idea, details, or the author's intent.
Connecting	Link the topic to personal experiences, other texts, or global knowledge. Making connections promotes deeper comprehension and retention.
	Practicing Critical Thinking
Text Analysis	Critically analyze texts by evaluating the author's purpose, tone, and perspective. Consider the efficacy of the arguments and facts offered.
Texts Comparison	Compare different texts on the same topic in order to grasp diverse points of view and improve understanding. This technique aids in identifying biases and establishing a balanced viewpoint.
	Practice and Application
Regular Reading	Read a wide range of automation-related literature (technical manuals, research papers, and industry periodicals) on a regular basis.
Discussion and collaboration	Join a study group or professional forum to discuss the readings. Explaining topics to others strengthens your comprehension and exposes you to other views.

APPLYING READING TECHNIQUES TO AUTOMATION TECHNOLOGY

1. Case Studies and Real-World Examples

Reading case studies on the implementation of automation systems in various industries provides practical insights and enhances comprehension of theoretical concepts.

2. Technical Manuals and Documentation

Reading technical manuals and user documentation can help you become familiar with the terminology and format used in the sector.

3. Research Papers and Journals

Stay up-to-date on automation technology research trends and approaches by reading academic papers and publications.

Developing effective reading skills is indispensable for anyone involved in automation technology. By employing techniques such as skimming, scanning, active reading, critical thinking, and vocabulary building, individuals can enhance their comprehension and retention of complex technical information. Regular practice, structured note-taking, and application of these techniques to real-world materials will lead to significant improvements in reading efficiency and overall understanding, fostering professional growth and expertise in the field of automation technology.

4. Importance of Speaking Skills in Automation Technology

In the dynamic and interdisciplinary field of automation technology, speaking skills play a critical role in ensuring effective communication, collaboration, and professional success. Whether it's presenting complex ideas, engaging with clients and stakeholders, providing training and support, or advancing in one's career, the ability to articulate thoughts clearly and confidently is invaluable. Developing and honing these skills can lead to more successful projects, stronger professional relationships, and greater contributions to the field of automation technology.

Let’s consider some of the reasons proving that speaking skills are vital for automation technology specialists.

Excellent speaking skills are necessary for:

1) *effective collaboration and teamwork.*

Regular team meetings are essential for project coordination. Being able to articulate ideas clearly and listen actively enhances team collaboration and problem-solving.

2) presentation and demonstration

Effective project proposal presentation can affect whether or not automation initiatives are approved and funded. Clear and convincing speaking skills are required to communicate the project's worth and feasibility.

Automation specialists frequently have to show clients, stakeholders, and team members how their solutions operate. Clear explanations and the ability to confidently answer questions are essential requirements throughout these demonstrations.

TECHNIQUES FOR EFFECTIVE COMMUNICATION IN MEETINGS AND PRESENTATIONS

Know Your Audience: Tailor your message based on the audience's level of understanding.

If you have to deal with specialists and technical teams, technical terminology and detailed explanations will be appropriate.

For non-technical stakeholders simplify concepts and focus on the benefits and impact of the technology.

Structure Your Content: Organize your presentation logically.

Give an outline of the primary themes you'll discuss.

Divide the text into several parts, each concentrating on a different aspect of the issue.

Summarize critical takeaways and make practical recommendations.

Include visual aids to enhance your presentation.

Diagrams and flowcharts will help to demonstrate complicated processes and workflows.

Graphs and Charts will be helpful in displaying data and trends in an understandable style.

If you use slides, don't overload them with photos. Keep them simple, with minimum text to support your speech.

Use tools and software to improve communication.

Use tools such as PowerPoint, Prezi, or Keynote to produce visually engaging presentations.

Use apps like Zoom, Microsoft Teams, or any other to conduct virtual meetings and collaborate in real-time.

Showcase automation technologies through live demonstrations or pre-recorded movies.

Foster interaction and participation of your audience.

Encourage questions throughout or at the end of your presentation.

Use tools such as live polls to assess audience knowledge and interest.

Schedule time for open conversation and criticism.

Anticipate Questions and Challenges.

Develop a list of frequently asked questions and answers.

Have backup plans in case of technical difficulties or unexpected issues.

Follow Up: Maintain continuity and handle any unsolved issues.

Send a follow-up email that summarizes the main points and conclusions.

Include hyperlinks to extra resources or documents.

Ask for feedback to improve future presentations.

By applying these techniques, you can communicate more effectively, ensuring that your message is clear, engaging, and impactful in meetings and presentations.

3) technical training and support

Automation technology frequently necessitates training for end users or team members. Effective speaking skills are necessary to explain complex technical concepts in an intelligible way.

When providing technical support, clear verbal communication helps in diagnosing problems, explaining solutions, and guiding users through troubleshooting process.

4) client and stakeholder interaction

Effective communication skills are required while communicating with clients in order to correctly acquire their requirements and comprehend their demands. This contributes to the development of solutions that meet clients' expectations and demands.

Regular updates and progress reports to clients and stakeholders require clear and concise communication to keep them informed and manage expectations.

5) problem solving and decision making

Speaking skills are essential during brainstorming meetings since they allow you to share ideas, offer feedback, and expand on others' recommendations.

Critical discussions regarding project challenges and potential solutions need clear articulation of ideas and persuasive reasoning.

6) professional growth and networking

Attending industry conferences, workshops, and seminars frequently includes speaking opportunities. Strong speaking skills let you present papers, participate in panel discussions, and network with your peers.

Effective communication is generally associated with leadership positions. Developing speaking skills can lead to promotion and leadership position within the field.

WORD LIST of the key information data

UNIT 1.

TERM	DEFINITION	EXPLANATION
A		
AI (Artificial Intelligence)	The simulation of human intelligence processes by machines, especially computer systems.	AI is used to perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
B		
Biotechnology	The use of living systems and organisms to develop or make products.	Involves the use of biological processes, organisms, or systems to manufacture products intended to improve the quality of human life.
C		
Cloud Labs	Remote laboratories where experiments are conducted through a computer interface.	Scientists send samples to the cloud lab and control experiments remotely, allowing for large-scale, automated research without being physically present in the lab.
D		
Development	The process of creating new ideas, products, or methods.	Involves taking innovative concepts through various stages of testing and refinement to produce a final product.
E		
Engineering	The application of scientific and mathematical principles to practical ends.	Engineers use their knowledge to design, build, and maintain structures, machines, and systems.
F		
Functional Model	A prototype that demonstrates the functions and features of a product.	Used in software and hardware development to test and refine the operational aspects of a system before full production.
G		
Genetic Engineering	The direct manipulation of an organism's genes using biotechnology.	Techniques used in genetic engineering include cloning, gene transfer, and the creation of genetically modified organisms (GMOs).

H		
Hypothesis	A proposed explanation made on the basis of limited evidence as a starting point for further investigation.	In scientific research, hypotheses are tested through experiments to determine their validity.
I		
Innovation	The act of introducing new ideas, devices, or methods.	Innovations drive progress and can lead to significant improvements in technology and industry.
Innovator	A person who introduces new methods, ideas, or products.	Innovators are often responsible for significant advancements in various fields.
L		
Laboratory Automation	The use of technology to perform laboratory tasks without human intervention.	Increases efficiency and accuracy in scientific research by automating repetitive tasks.
M		
Mode	A simplified representation of a system or phenomenon.	Models are used in science and engineering to simulate real-world processes and predict outcomes.
P		
Pandemic	An outbreak of a disease that occurs on a global scale.	Pandemics pose significant challenges to public health and require coordinated international responses.
Prototype	A preliminary model of a product used for testing and development.	Prototypes allow designers to test functionality and identify improvements before final production.
Prototyping	The process of creating prototypes to test and refine products.	Used in various fields such as software development, programming, and hardware design.
R		
Reproducibility	The ability of an experiment or study to be replicated by others.	Ensures that scientific findings are reliable and can be verified by independent researchers.
S		
Scientist	A person who conducts scientific research to advance knowledge in an area of interest.	Scientists use the scientific method to investigate phenomena, acquire new knowledge, and develop new technologies.
Scientific	Relating to or used in science.	Describes methods, principles, or processes that are based on or characteristic of the scientific method.
Self-Driving Labs	Laboratories that use AI and automation to conduct	These labs autonomously generate hypotheses, design experiments, and

	experiments without human intervention.	analyze results, increasing research efficiency.
T		
TERM	**DEFINITION**	**EXPLANATION**
Technological	Relating to technology.	Describes innovations and advancements in the application of scientific knowledge for practical purposes.
Technologist	A specialist in a particular field of technology.	Technologists apply scientific and technical knowledge to solve practical problems and develop new technologies.
Technology	The application of scientific knowledge for practical purposes, especially in industry.	Includes tools, machines, and systems developed through scientific and engineering efforts.

UNIT 2

A		
Analysis	The process of examining data to draw conclusions.	Researchers analyze collected data to interpret and find meaning, leading to conclusions about their hypotheses.
Apple Computer	A technology company co-founded by Steve Jobs and Steve Wozniak in 1976.	Known for its innovative products such as the iPod, iPhone, iPad, and services like iTunes and iCloud.
B		
Blockchain	A decentralized digital ledger used for recording transactions across multiple computers.	Used in various applications, including Proof of Learn, to enhance security and transparency in digital operations.
C		
Catalyst	A factor that speeds up or stimulates a process or change.	In history, catalysts such as key innovators have driven technological and scientific advancements.
D		
Data	Information obtained through observations and measurements.	Data is collected, processed, and analyzed in research to test hypotheses and reach conclusions.
E		

Empirical	Based on observation or experiment rather than theory.	Empirical research relies on observed and measured phenomena to test hypotheses and draw conclusions.
Experiment	A scientific procedure to test a hypothesis.	Experiments are conducted to validate or refute suggested explanations through controlled observations and measurements.
Evidence	Information that supports a conclusion or hypothesis.	In scientific research, data and other information serve as evidence to support findings and conclusions.
I		
Invention	A new machine, device, or product created through ingenuity.	Inventions result from the inventive process and can significantly impact society and industry.
Inventiveness	The ability to design and create new machines, devices, or products.	Inventiveness drives innovation and technological progress, as seen in the work of key innovators.
Inventor	A person who creates new machines, devices, or products.	Inventors like Steve Jobs and Mark Zuckerberg have introduced groundbreaking technologies and platforms.
M		
Measurement	The process of obtaining data by quantifying observations.	Measurements are crucial in scientific research for collecting accurate and reliable data.
O		
Observation	The act of noting and recording phenomena as they occur.	Observations provide the raw data needed to test hypotheses and form scientific conclusions.
P		
Phenomenon	An observable event or occurrence.	Scientists study phenomena to understand natural processes and test hypotheses.
R		
Raw Data	Unprocessed and unanalyzed information collected during research.	Raw data is the initial set of observations and measurements that researchers analyze to draw conclusions.
Research	The systematic investigation into and study of materials and sources to establish facts and reach new conclusions.	Research involves collecting data, testing hypotheses, and drawing conclusions in various scientific fields.
Researcher	A person who conducts research to discover new information or test hypotheses.	Researchers work in laboratories or field settings to gather and analyze data, contributing to scientific knowledge.

S		
Study	A detailed examination and analysis of a subject or phenomenon.	Studies are published results of research efforts, often providing insights and conclusions based on data.
Synchronize	To cause things to occur or operate at the same time or rate.	iCloud synchronizes media, documents, and email across Apple devices, enabling seamless access to information.

UNIT 3

A		
Automation	The application of machines to tasks traditionally performed by humans, often involving self-governing systems.	Involves using programmed commands and automatic feedback control to execute tasks without human intervention, commonly seen in manufacturing and various industries.
Automation Equipment	Machines and devices used to implement automation in different processes.	Includes robots, conveyor systems, and computer-controlled machinery, essential for automating tasks in manufacturing and other sectors.
Automation System	A coordinated set of machines and controls designed to operate without human intervention.	An automation system integrates various components to perform tasks autonomously, ensuring efficiency and precision in operations.
F		
Full Automation	A state where all operations within a process are performed without any human intervention.	Represents the highest level of automation, where systems are entirely self-sufficient and can perform complex sequences of tasks independently.
H		
Human Labour	Work performed by human beings, traditionally involving physical or mental effort.	In automation, human labour is often replaced or supplemented by machines to increase efficiency and reduce the need for manual work.
I		
Increasing Automation	The process of progressively implementing more automated systems and equipment in operations.	Involves integrating advanced technologies to perform a growing number of tasks automatically, leading to enhanced productivity and reduced reliance on human labour.

Industrial Robot	A programmable machine designed to perform tasks that typically require human effort.	Often used in factories for tasks such as welding, assembly, and material handling, industrial robots enhance efficiency and precision in manufacturing.
L		
Level of Automation	The extent to which automation is applied within a process or system.	Can range from partial automation, where some tasks are automated, to full automation, where all tasks are performed by machines without human intervention.
M		
Mechanization	The replacement of human labour with machines.	Unlike automation, mechanization does not necessarily involve self-governing systems or automatic feedback control.
P		
Powered Mechanical Arm	A key component of modern industrial robots, capable of performing a sequence of motions.	Used in tasks such as loading, unloading, and assembly, the mechanical arm can be programmed for various operations in manufacturing.
Programmed Commands	Instructions coded into a machine to perform specific tasks automatically.	Essential for the functioning of automated systems, these commands ensure that machines operate according to predefined sequences without human input.
S		
Self-Governing System	A system capable of operating independently without human intervention.	Utilizes feedback control and programmed commands to maintain and adjust operations autonomously.
Sophisticated Systems	Highly advanced and complex automated systems.	These systems use cutting-edge technology, such as artificial intelligence and machine learning, to perform intricate and precise tasks.

UNIT 4

A		
Advances	Developments or improvements in a particular field.	Advances in various technologies have significantly contributed to the progress in automation technology.
Artificial Intelligence	A field of computer science that focuses on creating systems capable of performing tasks that	AI involves programming computers to learn, understand language, make reasoning, and solve problems, enabling

	normally require human intelligence.	machines to communicate with humans and execute complex instructions.
C		
Calculations	Mathematical determinations made by computers.	In automation, faster and more complex calculations enabled by digital computers improve control functions and efficiency.
Computer Programs	Sets of instructions that a computer follows to perform tasks.	Advances in software development have made programming languages easier to use and more powerful, enhancing data processing and logic capabilities in automation.
D		
Data-Processing	The collection and manipulation of data to produce meaningful information.	Modern programming languages with powerful data-processing capabilities are essential for complex automation tasks.
Digital Computer	An electronic device that processes data using binary code.	The invention of digital computers like ENIAC and UNIVAC I revolutionized automation by enabling sophisticated control functions and faster calculations.
E		
ENIAC (Electronic Numerical Integrator and Computer)	One of the first electronic general-purpose computers, developed in 1946.	ENIAC's ability to perform rapid calculations marked a significant milestone in automation technology.
F		
Feedback Control Systems	Systems that automatically adjust their operation based on data from sensors.	These systems rely on advancements in sensor technology to maintain desired performance in automated processes.
I		
Intelligent Machines	Machines that use artificial intelligence to perform tasks typically requiring human intelligence.	Expected to communicate with humans and execute high-level instructions, transforming automation technology.
L		
Logic Capabilities	The ability of computers to perform logical operations.	Enhanced logic capabilities in programming languages enable more complex and reliable automation processes.
M		
Measuring Devices	Instruments used to assess physical properties.	Improvements in sensor technology have expanded the types and accuracy of measuring devices used in automation.

Miniaturization	The process of making devices smaller and more efficient.	Miniaturization in computer technology has resulted in smaller, less expensive, and faster machines, boosting automation capabilities.
P		
Programming Languages	Formal languages comprising a set of instructions that produce various kinds of output.	Formal languages comprising a set of instructions that produce various kinds of output.
S		
Sensor Technology	The development and application of sensors for measuring physical properties.	Advances in this technology provide essential components for feedback control systems in automation.
Simultaneous Improvements	Concurrent advancements in various technological fields.	The parallel progress in computer hardware, software, and sensor technology has collectively enhanced automation.
U		
UNIVAC I (Universal Automatic Computer)	**The first commercially produced digital computer, developed in 1951.**	**UNIVAC I's capabilities in processing data rapidly and accurately contributed significantly to automation technology.**

UNIT 5

A		
Actuating Devices	Components that make changes in a process to influence the output variable in a feedback system.	These devices, such as motors and valves, execute the commands from the controller to adjust the system's operation.
C		
Closed-loop Feedback Control	A type of feedback system where the output is measured and compared to the input to reduce discrepancies.	This system ensures that the process operates as desired by continuously adjusting based on feedback.
Connectivity	The ability of computers and software to communicate and share resources.	Connectivity enables different systems and devices to interact, facilitating communication and resource sharing.
Controller	A device that compares the measured output with the reference input value in a feedback system.	The controller processes the difference between input and output and directs the actuating devices to correct the output.

D		
Data	Information obtained by making observations and measurements.	Data is essential for feedback control systems to monitor and adjust processes accurately.
Distance Learning	Educational process facilitated by electronic communication technologies, allowing learning from remote locations.	Distance learning enables access to educational resources and interactions beyond physical classrooms.
E		
Edutainment	A combination of education and entertainment.	Multimedia systems providing educational content in an entertaining format to enhance learning experiences.
Expert Systems	Software that mimics the decision-making abilities of a human expert.	Used in fields like medical diagnosis to assist professionals by suggesting tests and treatments based on data analysis.
F		
Feedback Control System	A system that uses feedback to control the state or output of a process.	Comprises input, process, output, sensing elements, and controller/actuating devices to maintain desired operation.
I		
Input	The reference value or set point in a feedback control system.	Represents the desired operating condition that the system aims to achieve.
M		
Multimedia Systems	Systems that combine text, sound, video, animation, and graphics.	Enhance interaction and make information more appealing and engaging.
O		
Output	The variable of the process that is measured and compared to the input in a feedback system.	The system's actual performance, which is monitored to ensure it meets the desired input values.
P		
People Power	The influence and decision-making ability of users and professionals in the computing field.	Ensures that technology is integrated and used in a socially responsible and efficient manner.
Programming Languages	Formal languages comprising a set of instructions that produce various kinds of output.	Advances in programming languages enhance automation by making software development easier and more powerful.

S		
Sensing Elements	Measuring devices used in feedback loops to monitor output variables.	Essential for providing accurate data to the controller in a feedback control system.
Smart Cards	Cards embedded with microchips storing vital information.	Used for various purposes like health records, bank balances, and identification.
Smart House	A home with a built-in monitoring system to control various functions automatically.	Can manage lighting, window operations, appliances, and more to enhance convenience and efficiency.
Smart Machines	Machines with built-in computers designed to perform tasks typically done by humans.	They simplify tasks and improve efficiency, making life easier and more pleasant.
T		
Telecommute	Working remotely while staying connected to the office using computers.	Enables flexibility and can improve work-life balance while maintaining productivity.
Tiny Computing Devices	Small-sized computers used to control complex operations.	Found in various applications from medical equipment to household appliances, enhancing functionality and efficiency.

UNIT 6

A		
Actuating Devices	Components that execute commands from the controller to adjust the system's operation.	These devices, such as motors and valves, make changes in a process to influence the output variable in a feedback system.
B		
Bug	An error or flaw in software that causes it to function improperly.	Bugs can lead to crashes or confusing error messages, requiring debugging to resolve.
C		
Closed-loop Feedback Control	A feedback system where the output is measured and compared to the input to reduce discrepancies.	This system continuously adjusts based on feedback to maintain desired operation.
Command	An instruction given to a computer or an automated system to perform a specific task.	Commands in an automated system can range from simple actions to complex sequences.

Computer Memory	The storage space in a computer where data and programs are kept.	Modern automated systems use computer memory to store programmed commands for controlled actions.
Control Program	Software that directs the actions of an automated system.	The program contains logical instructions, allowing the system to make decisions during operation.
Controller	A device that compares the measured output with the reference input value in a feedback system.	The controller processes the difference between input and output and directs the actuating devices to correct the output.
Crash	A software failure causing the program to stop functioning.	Crashes often result in error messages and require the user to restart or debug the software.
D		
Decision-making Capacity	The ability of an automated system to make decisions during its operation.	This capacity is embedded in the control program through logical instructions for error detection, safety monitoring, human interaction, and process optimization.
E		
Error Detection and Recovery	The process of identifying and correcting errors in a system.	Automated systems with decision-making capabilities can detect errors and take corrective actions to ensure smooth operation.
Execute	To start or run a software program.	This term can also mean to carry out a command or instruction within a program.
H		
Human Interaction	The ability of an automated system to interact with human users.	This feature allows systems to respond to user inputs and provide feedback, enhancing usability and control.
L		
Logical Instructions	Commands in a control program that dictate the decision-making process of an automated system.	These instructions enable the system to perform tasks such as error detection, safety monitoring, and process optimization.
O		
Open-loop Control	A control method where actions are performed without feedback verification.	This method is used for simple commands where feedback is not necessary to ensure correct execution.
Open-source Software	Software that is free to use and modify.	Open-source software allows users to customize and improve the code, examples include Linux and Mozilla Firefox.

P		
Programmer	A person who writes software programs.	Also known as software developers, they create the instructions that tell a computer what to do.
Proprietary Software	Software that is not free to modify and is owned by an individual or company.	Examples include Microsoft Windows and Adobe Photoshop.
S		
Safety Monitoring	The process of ensuring that an automated system operates within safe parameters.	Systems with decision-making capabilities can monitor for safety issues and take actions to prevent accidents.
Sensor Technology	Devices that measure physical properties and provide data to control systems.	Advances in sensor technology enhance the ability of automated systems to monitor and adjust processes accurately.
Software	Instructions written by programmers that tell a computer what to do.	Software can be simple with few commands or complex with millions of lines of code.
Software Developer	A professional who writes and maintains software programs.	Also known as programmers, they create the code that directs computer operations.
Sophisticated Systems	Advanced automated systems with complex control programs and decision-making capabilities.	These systems can adjust their actions based on variations in input or operating conditions.
System Output	The result or effect produced by an automated system.	It is the variable measured and compared to the input to ensure the system functions correctly.

UNIT 7

A		
APT (Automatically Programmed Tools)	A programming language developed for programming machine tools.	Originated from research at MIT, APT was crucial for the advancement of numerical control by enabling automated instructions for machine operations.
D		
Die-casting Operation	A manufacturing process where molten metal is injected into a mold to form parts.	The first industrial robot was used to unload parts from a die-casting operation, highlighting the early application of robotics in manufacturing.
I		
Industrial Robotics	Automation technology involving programmable	Combines numerical control and teleoperator technologies, leading to

	mechanical devices for industrial tasks.	widespread adoption in various manufacturing processes since the 1960s.
N		
Numerical Control (NC)	A method of controlling machine tool axes using numbers coded on media such as punched paper tape.	Developed in the late 1940s and early 1950s, NC was demonstrated at MIT and formed a foundation for the development of robotics.
R		
Robotics	The technology dealing with the design, construction, and operation of robots.	Based on numerical control and teleoperator technologies, robotics has become integral to modern industrial automation.
T		
Teleoperator	A mechanical manipulator controlled remotely by a human operator.	Initially designed for handling radioactive materials, teleoperators contribute the concept of mechanical arms to industrial robotics.
U		
Unimation, Inc.	The first corporation dedicated to industrial robotics.	Founded by Joseph F. Engelberger to promote and develop robotic technologies for industrial applications.

UNIT 8

A		
Arm-and-body	The section of an industrial robot that consists of three joints connected by large links.	Used to move and position parts or tools in the robot's workspace, it provides the main structure and movement capability for reaching different areas.
B		
Body	Part of the robot's arm-and-body section.	Together with the arm, it supports and enables the movement and positioning of the robot's end effector or tool.
C		
Configuration	The specific arrangement and types of joints and links in a robot's arm-and-body section.	Determines the robot's work envelope and suitability for different applications.
D		
Displacement	The concern that robots may replace human jobs.	A challenge in automation where increasing use of robots may lead to fewer jobs for humans in certain sectors.

G		
Gripper	An end effector attached to the robot's wrist.	Used to grasp work parts or tools, allowing the robot to manipulate objects and perform tasks.
J		
Joint (Axis)	The movable component of the robot that causes relative motion between adjacent links.	There are five principal types of mechanical joints: two linear (translational motion) and three rotary (rotational motion).
L		
Link	The rigid member connecting the joints in a robot's manipulator.	Provides the structural integrity and support necessary for the robot's movement.
M		
Manipulator	The combination of links and joints in a robot.	Enables the robot to move materials, parts, tools, or specialized devices through variable programmed motions.
R		
Robotic Industries Association (RIA)	An organization that developed a widely accepted definition of an industrial robot.	Defines an industrial robot as a reprogrammable, multifunctional manipulator designed for various tasks.
Rotary Joint	A type of joint that allows rotational motion between links.	One of the three types of joints used in industrial robots to enable movement.
S		
Sensor	A device that detects changes in the environment and sends information to the robot's control system.	Essential for feedback control, ensuring the robot operates correctly and adapts to changes.
W		
Wrist	The section of an industrial robot consisting of two or three compact joints.	Used to orient parts or tools at the work location, providing precision in the robot's tasks.

UNIT 9

A		
Algorithms	A set of rules or steps used to solve a problem or perform a computation.	Algorithms are essential for developing AI, as they determine how a computer processes information and makes decisions.

Augmenting	Enhancing or adding to something to improve its capabilities.	In the context of human evolution, augmenting refers to enhancing human abilities by integrating technology, such as implanting computers in the brain to improve cognitive functions.
Autonomous	Operating independently without human intervention.	Autonomous machines, such as self-driving cars or drones, can perform tasks and make decisions on their own based on programmed algorithms and sensor data.
B		
Biologically	Relating to the processes of living organisms.	Human evolution occurs biologically, which is a slow process compared to the rapid advancements in AI and machine learning.
C		
Campaign to Stop Killer Robots	An advocacy group focused on preventing the development and use of autonomous weapons systems.	The group raises ethical concerns about machines making life-and-death decisions without human oversight and advocates for regulations to prevent the creation of such weapons.
Computing Power	The ability of a computer system to process data and perform calculations.	High computing power is crucial for running complex AI algorithms and handling large amounts of data quickly and efficiently.
D		
Drones	Unmanned aerial vehicles that can be controlled remotely or operate autonomously.	Drones are used in various applications, including military operations and delivering life-saving equipment, highlighting the growing presence of AI in everyday life.
E		
Evolution	The gradual development of something, especially from a simple to a more complex form.	Human evolution is a slow biological process, but technological advancements like AI can accelerate certain aspects of human development through augmentation.
Ethical	Relating to moral principles or the branch of knowledge dealing with these.	The development of autonomous machines, especially those used in military applications, raises significant ethical concerns about the implications for human life and decision-making.

H		
Human Intelligence	The intellectual capacity of humans, including abilities such as learning, reasoning, and problem-solving.	AI aims to replicate or surpass human intelligence, leading to debates about the potential consequences of machines becoming more intelligent than humans.
I		
Implant	Insert or fix (tissue or an artificial object) in a person's body, especially by surgery.	The concept of implanting computers in the human brain represents a futuristic view of how technology might enhance human capabilities.
M		
Mathematical Ability	The capacity to perform mathematical calculations and understand mathematical concepts.	Augmenting human brains with technology could enhance mathematical ability, allowing for faster and more accurate computations.
Murderbots	A colloquial term for autonomous weapons capable of making life-and-death decisions without human intervention.	The potential development of such machines raises significant ethical and safety concerns, prompting calls for strict regulations.
S		
Self-Driving Cars	Vehicles equipped with technology that allows them to navigate and operate without human control.	Self-driving cars are a significant advancement in AI, showcasing the potential for autonomous systems to improve transportation, albeit with some initial challenges and risks.
Sensor Data	Information collected by sensors, which are devices that detect and measure physical properties.	Autonomous machines rely on sensor data to make informed decisions and operate effectively in their environments.
Sentry Robots	Robotic systems designed to monitor and secure areas, often equipped with weapons.	These robots are used in military applications, raising concerns about the ethical implications of machines with the power to kill.
Superseded	Replaced by something newer and more advanced.	There is a concern that rapid advancements in AI could lead to humans being superseded by more intelligent machines.
T		
Teething Problems	Initial problems or difficulties experienced during the early stages of a new process or development.	Early adoption of technologies like self-driving cars and robot vacuum cleaners often involves overcoming teething problems to achieve reliable performance.
Terminator	A reference to a fictional character from the "Terminator"	The term is often used to illustrate the potential dangers of developing

	film series, representing a dystopian vision of autonomous machines.	autonomous weapons systems that could act independently of human control.

U

Unrest	A state of dissatisfaction, disturbance, and agitation, often leading to public demonstrations or conflicts.	The displacement of human jobs by robots and AI could lead to social unrest due to large-scale unemployment and economic disruption.

UNIT 10

A

Adapt	To adjust or modify something to suit a particular purpose or individual.	Intelligent robots will be able to adapt information to each student's needs by reading their faces, movements, and possibly even brain signals.
Assistant	A person or thing that helps someone else, often in a subordinate role.	In the future, teachers may act as assistants while robots handle the primary job of transferring information to students.

B

Brain Signals	Electrical signals produced by the brain that can be detected and interpreted by specialized equipment.	Advanced robots might be able to read brain signals to tailor educational content to individual students.

C

Connect	To establish a relationship or link with someone or something.	Despite their capabilities, robots are unlikely to connect with humans on an emotional level as effectively as human teachers can.
Consumer Electronics	Electronic devices intended for everyday use, typically in private homes.	Students interested in becoming computer experts may enjoy exploring and understanding the inner workings of consumer electronics.

E

Education Expert	A person with extensive knowledge and expertise in the field of education.	Anthony Seldon is an education expert who predicts that robots will play a major role in classrooms by 2027.
Empathy	The ability to understand and share the feelings of another.	Robots are unlikely to develop empathy, a key component in connecting with and effectively teaching students.

G		
Geek	A person who is very interested in and knows a lot about a particular subject, often technology or computers.	Compulearn views the term 'geek' positively, celebrating those who are passionate about computers and technology.
I		
Intelligent Robots	Robots equipped with advanced artificial intelligence capable of performing complex tasks.	These robots will be able to read and interpret students' non-verbal cues to provide personalized education.
R		
Reports	Written or spoken accounts that give information about a particular subject.	Robots could assist teachers by writing reports, freeing up time for more direct educational interactions.
Robot Takeover	The process of robots assuming roles traditionally held by humans.	Anthony Seldon predicts a robot takeover in classrooms by 2027, where robots will handle the main teaching duties.
U		
Unemployed	Without a job; not employed.	The potential for robots to replace human jobs, including teaching, raises concerns about unemployment and the socioeconomic impact of technological advancements.

UNIT 11

A		
Assembly	The process of putting together various components to create a finished product.	Due to the high cost of manual labor, the use of robots in assembly operations is expected to grow, as they can efficiently handle repetitive tasks.
C		
Continuous Arc Welding	A welding process where an electric arc is continuously used to melt and join materials.	Robots can perform continuous arc welding, which is used in various manufacturing processes for creating strong and consistent welds.
G		
Gripper	A device attached to a robot that allows it to grasp and manipulate objects.	In machine loading and unloading operations, robots use grippers to hold and move parts from one location to another.

I		
Inspection	The process of examining products or components to ensure they meet specified standards and requirements.	Robots are used in inspection tasks to check the quality and accuracy of assembled parts, improving efficiency and consistency in manufacturing.
M		
Machine Loading and Unloading	The process of placing materials or parts into a machine for processing and then removing them once the process is complete.	Robots equipped with grippers handle the loading and unloading of machines, increasing productivity and reducing the need for manual labor.
Material Handling	The movement, protection, storage, and control of materials and products throughout manufacturing, warehousing, distribution, consumption, and disposal.	Material transfer and machine loading/unloading are examples of material-handling applications where robots are used to transport and position materials efficiently.
Material Transfer	The movement of materials from one location to another within a manufacturing or processing environment.	Robots perform material transfer tasks by moving parts from one conveyor to another or arranging components on pallets based on calculated arrangements.
P		
Pallet	A flat transport structure that supports goods in a stable manner while being lifted by a forklift, pallet jack, or other jacking device.	In complex material transfer operations, robots place components on pallets in specific arrangements, optimizing space and organization.
Processing Operations	Operations in which a robot uses a tool to perform a specific task on a work part, such as cutting, welding, or painting.	Robots manipulate tools to perform various processing operations, such as spot welding and spray painting, enhancing precision and efficiency.
S		
Spray Painting	A process where a device sprays a coating (paint, ink, varnish, etc.) through the air onto a surface.	Robots perform spray painting tasks with high precision, ensuring consistent application and reducing waste.
Spot Welding	A welding process in which metals are joined by the heat obtained from resistance to electric current flow.	Spot welding is a common application for industrial robots, especially in the automotive industry for welding body parts.
T		
Tool	A device or implement used to carry out a specific function, especially in manufacturing or processing.	In robotic processing operations, robots manipulate various tools to perform tasks such as welding, painting, and cutting.

W		
Work Part	A piece of material or component that is being processed or assembled.	Robots handle work parts during various operations, such as material transfer, machine loading/unloading, and processing, to enhance efficiency and accuracy.

UNIT 12

C		
Control Box	A device used to drive the manipulator through its motion sequences during lead-through programming.	The control box allows operators to manually guide the robot through the required motions, recording them into the robot's computer memory.
D		
Data Processing	The collection and manipulation of data to produce meaningful information.	In robot programming, data processing capabilities allow robots to perform calculations and interact with other computer devices.
Decision Making	The process of making choices by identifying a decision, gathering information, and assessing alternative resolutions.	Robot programming includes decision-making statements that enable robots to respond to different inputs and situations appropriately.
Dynamics	The study of forces and torques and their effect on motion.	Understanding dynamics is crucial for creating robot programs that ensure efficient and safe movements.
I		
Industrial Robots	Automated, programmable machines capable of moving materials, parts, tools, or specialized devices through various programmed motions.	Industrial robots are used in various sectors, including manufacturing and healthcare, to perform tasks that require precision and repetition.
Input/Output (I/O)	The communication between an information processing system and the outside world.	In robot programming, I/O commands manage the interaction between the robot and external devices or sensors.
K		
Kinematics	The study of motion without considering the forces that cause it.	Kinematics is essential for understanding how a robot moves and positions itself in space.
L		
Lead-Through Programming	A method of programming robots by physically guiding them through the desired	This method involves either manually moving the robot or using a control box to teach the robot specific tasks.

	motions and recording these movements.	
M		
Manipulator	The arm of a robot designed to interact with objects in its environment.	The manipulator performs the movements and tasks specified in the robot's program.
Motion Control	Commands that instruct a robot to move its manipulator to a specific location in space.	Motion control is fundamental to robot programming, as it determines the precise movements of the robot.
O		
Offline Programming	The creation of a robot's program on a computer before transferring it to the robot.	Offline programming is used for tasks requiring high precision and accuracy, allowing engineers to design and refine the program before implementation.
Online Programming	The method of programming a robot in real-time while it is in operation.	Online programming is useful for tasks requiring adaptability, enabling operators to make real-time adjustments to the robot's actions.
Output Line	A specific pathway through which a robot's controller sends signals to external devices.	Output lines are used to control devices like motors by sending commands from the robot's controller.
P		
Programming Language	A formal language comprising a set of instructions that produce various kinds of output.	In robot programming, specialized languages include commands for robot control, data processing, and interaction with other devices.
Programming Methods	Different approaches to creating programs for robots.	The two primary methods are offline programming, which is done on a computer, and online programming, which is done in real-time.
R		
Robot Controller	The computer system that directs the actions of a robot.	The controller processes the program and sends commands to the robot's manipulator and other components.
Robot Language	A programming language specifically designed for controlling robots.	Robot languages include commands for motion control, data processing, and interaction with external devices, tailored to the needs of robotic systems.
S		
Signal	An electrical impulse or message sent from one device to another.	Signals are used to control various functions within a robot system, such as turning motors on or off.

UNIT 13

B		
Batch Manufacturing	A manufacturing process in which goods are produced in groups or batches rather than in a continuous stream.	Programmable automation is often used in batch manufacturing, where production equipment must be reprogrammed and adjusted for each new batch of products.
C		
Cams	Rotating or sliding pieces in mechanical linkages used to transform rotational motion into linear motion.	In fixed automation, cams are part of the hardware setup that dictates the sequence of operations for manufacturing a product.
Centralized Production Plant	A large, fixed-location manufacturing facility where products are produced and distributed.	The trend is moving away from centralized production plants towards smaller, movable factories closer to resources and customers.
Chemical Processes	Industrial processes that involve chemical reactions to transform raw materials into products.	Some fixed automation systems are used in chemical processes, where the equipment setup determines the processing sequence.
Communications Support	The infrastructure and systems that enable effective communication and control in automated processes.	Modern automation relies heavily on high-order communications support, including fast networks and diagnostic software, to ensure reliability and efficiency.
F		
Flexible Automation	An automation system that allows quick and automatic changeover between different product styles without significant downtime.	Flexible automation extends programmable automation by enabling rapid reprogramming off-line, allowing for the production of mixed products sequentially.
Fixed Automation	A type of automation where the processing sequence is determined by the equipment setup, which is not easily altered.	A type of automation where the processing sequence is determined by the equipment setup, which is not easily altered.
H		
Hierarchical Diagnosis	A structured approach to diagnosing and correcting errors in automated systems.	High levels of reliability in automated processes are maintained through hierarchical diagnosis, which provides error-correction advisories via centralized operations.
I		
Industrial Automation	The use of control systems, such as computers or robots, for handling different processes	Industrial automation encompasses various technologies, including nanotechnology, MEMS, and M2M

	and machinery in an industry to replace human intervention.	networking, to enhance productivity and efficiency.
L		
Lead-Through Programming	A method of robot programming where the robot is physically guided through the desired motions, which are then recorded.	This method involves either manually moving the robot or using a control box to teach the robot specific tasks.
M		
Machine to Machine (M2M) Networking	The communication between devices using a network without human intervention.	M2M networking is crucial for modern industrial automation, allowing machines to communicate and coordinate actions seamlessly.
Machine Transfer Lines	A series of automated machines arranged in a sequence to perform different stages of manufacturing.	Common in fixed automation, especially in the automotive industry, where they ensure high production rates.
MEMS (Micro-Electro-Mechanical Systems)	Miniaturized mechanical and electro-mechanical elements that are made using microfabrication techniques.	MEMS, combined with nanotech sensors, play a significant role in modern automation by providing precise measurements and controls.
N		
Nanotechnology	The manipulation of matter on an atomic, molecular, and supramolecular scale.	Nanotechnology is a critical inflection point for industrial automation, enabling the development of nanoscale assembly systems and advanced sensors.
Numerical-Control Machine Tool	A machine controlled by a computer program to perform precise machining operations.	An example of programmable automation, where the machine tool's operations are directed by coded instructions stored in computer memory.
O		
Off-Line Programming	The process of creating a robot's program on a computer before transferring it to the robot.	Used in flexible automation to minimize downtime and allow for quick reprogramming without using production equipment.

UNIT 14

A		
Automated Production Line	A series of workstations connected by a transfer system that moves parts between them.	This system exemplifies fixed automation, designed for long production runs, producing millions of

		units over several years. Each station performs specific processing functions to assemble the final product step by step.
Automotive Sector	An industry focused on the design, development, manufacturing, marketing, and selling of motor vehicles.	The automotive sector frequently uses automated production lines for processes like machining and pressworking to produce various vehicle components.
C		
Complex Element	A component that requires multiple processing steps to complete.	In automated production, complex elements often require several presses in series, with handling devices transferring parts between presses to complete the manufacturing process.
M		
Machining	A manufacturing process where metal is removed by a cutting or shaping tool to create a desired shape.	Commonly used to manufacture machinery and motor components, machining is a critical process in automated production lines in the automotive sector.
P		
PLCs (Programmable Logic Controllers)	Specialized computers that connect with industrial equipment to execute timing and sequencing operations.	PLCs are essential for operating automated manufacturing lines, ensuring that all operations, part transfers, and activities are properly scheduled and coordinated.
Pressworking	A manufacturing process that involves cutting and shaping sheet metal pieces.	Used to produce items like automobile body panels, outer shells of large appliances, and metal furniture, pressworking often involves multiple presses linked in series for automated production.
S		
Scheduling and Coordination	The organization and management of all operations, part transfers, and activities in a manufacturing process.	For an automated transfer line to function successfully, effective scheduling and coordination are crucial to ensure smooth and efficient production.
W		
Workstations	Specific locations in a production line where particular processing functions are performed.	Each workstation is designed to conduct a specific task, contributing to the step-by-step assembly of the final product as it moves along the automated production line.

UNIT 15

A		
Airline Reservation Systems	Computerized systems used by airlines to manage flight bookings and seat allocations.	These systems continually check the status of all flights, compare requests for space, grant available space, and update reservation status files. They allow ticket agents to obtain information on seat availability instantly and passengers to book seats in advance.
Automated Pilots	Automation systems used in aircraft and trains to control navigation and operations.	Automated pilots are examples of automation in the transportation sector, providing functions such as maintaining course and altitude in aircraft and regulating speed and stops in trains.
C		
Communications Automation	The use of automated systems in managing communications processes, such as telephone switching.	Modern electronic telephone switching systems monitor thousands of lines, establish connections, transfer calls, diagnose problems, and perform self-tests.
Computerized Reservation Systems	Digital systems that manage reservations for transportation services like airlines.	These systems allow for real-time updates and management of booking statuses, providing information quickly to ticket agents and allowing passengers to book seats in advance.
M		
Modern Electronic Telephone Switching Systems	Advanced systems using digital computers to manage telephone line operations.	These systems perform tasks such as monitoring lines, establishing connections, storing dialed numbers, and providing customer services like call transfers and call-backs.
S		
Service Sectors Automation	The implementation of automation technologies in service industries.	Examples include automated telephone systems and computerized reservation systems, enhancing efficiency and service quality in sectors like communications and transportation.
T		
Transportation Automation	The application of automation technologies in transportation systems.	This includes automated pilots in aircraft, computerized reservation systems, and urban mass-transit systems, improving efficiency and service in the transportation industry.

UNIT 16

B		
Bar Code	An identification symbol consisting of a series of wide and narrow bars attached to a product.	It can be scanned and recognized by a bar-code reader to quickly identify items and update inventory records.
Bar-Code Reader	A device that scans bar codes to identify products and enter their prices into sales transactions.	It also updates inventory records automatically.
C		
Computerized Systems	Technology setups in retail stores that automate sales transactions and inventory management.	These systems reduce the need for manual clerical work and speed up processes.
I		
Inventory Management	The process of overseeing and controlling the ordering, storage, and use of products in a store.	Computerized systems update inventory records automatically as sales occur.
L		
Laser Beam Reader	A type of bar-code reader that uses a laser beam to scan bar codes on products.	It identifies them quickly and accurately for sales transactions and inventory updates.
M		
Merchandise	Goods that are bought and sold in retail stores.	Automation has transformed how merchandise is managed, sold, and reordered.
S		
Stock	The inventory or supply of goods available for sale in a store.	Each sales transaction depletes the stock, and automated systems track these changes in real time.
U		
Universal Product Code (UPC)	A standardized bar code adopted by the grocery industry in 1973, used to identify products in retail stores.	It enables automated sales transactions and inventory management.

UNIT 17

A		
Appliances	Devices or machines typically used in households to perform domestic tasks.	In domotics, appliances such as refrigerators, washing machines, and ovens can be controlled remotely for increased convenience and efficiency.
Automation	The use of technology to operate systems or devices without human intervention.	Domotics involves automating various home systems like lighting, heating, and security to improve comfort and efficiency.
C		
Control Systems	Integrated systems that manage the operations of devices and appliances.	These systems enable centralized control of various home automation devices, often through a smartphone or tablet.
D		
Domotics	The integration of information technology, electrotechnics, and electronics to create a smart home environment.	Domotics allows for remote control and automation of home systems, improving living conditions and comfort.
E		
Efficiency	The ability to accomplish a task with minimal waste of time and resources.	Home automation through domotics enhances efficiency by automating routine tasks and reducing energy consumption.
Electrotechnics	The branch of engineering concerned with practical applications of electricity in technology.	Electrotechnics is a key component of domotics, as it involves the design and implementation of electrical systems in smart homes.
Electronics	The branch of physics and technology concerned with the design of circuits using transistors and microchips.	Electronics plays a crucial role in domotics by enabling the creation and functioning of smart devices and control systems.
E		
Home Automation Systems	Systems that automate various functions within a home, such as lighting, heating, and security.	These systems are a core aspect of domotics, providing convenience and centralized control.
I		
Integration	The process of combining different systems or components to function as a unified whole.	In domotics, integration ensures that various smart devices and systems work together seamlessly to meet the changing needs of users.

R		
Remote Control	The ability to operate a device from a distance.	Domotics allows users to control home systems remotely using devices like smartphones and tablets, adding convenience and flexibility.

S		
Security System	A system designed to detect intrusion or unauthorized entry into a building or area.	In a smart home, security systems can be automated and controlled remotely, enhancing safety and peace of mind.
Smart Home	A home equipped with technology to enable remote control and automation of systems and devices.	The concept of a smart home is central to domotics, which aims to improve the quality of living by integrating various technologies.

T		
Technology Integration	The process of incorporating various technological systems and devices into a single, cohesive system.	Effective technology integration in domotics ensures that all smart home devices communicate and operate efficiently to meet users' needs.

UNIT 18

A		
Artificial Intelligence	A branch of computer science focused on creating systems capable of performing tasks that typically require human intelligence.	These tasks include learning, reasoning, problem-solving, perception, and language understanding. AI is used to provide businesses with advanced solutions, analytics, and insights.
Automation Technologies	Technologies designed to operate tasks with minimal human intervention, increasing efficiency, accuracy, and productivity.	These include robotic process automation (RPA), machine learning, and natural language processing (NLP).

B		
Business Process Management	A discipline involving the modeling, analysis, and optimization of business processes.	It aims to improve corporate performance by managing and optimizing a company's business processes.

C		
CIOs (Chief Information Officers)	Senior executives responsible for managing and implementing information and computer technologies in an organization.	They play a crucial role in integrating intelligent automation, machine learning, and predictive analytics into business strategies.

Compound Annual Growth Rate (CAGR)	The mean annual growth rate of an investment over a specified period of time longer than one year.	It is used to measure the growth of the intelligent process automation market, which is projected to increase at a CAGR of 13.89% from 2023 to 2032.
I		
Intelligent Automation	The process of enhancing business operations through advanced technologies like RPA, AI, and business process management.	It aims to optimize efficiency, productivity, and decision-making capabilities by automating repetitive and rule-based tasks and analyzing unstructured data.
Intelligent Process Automation Market	The market segment that includes technologies and solutions aimed at automating business processes intelligently.	Valued at USD 13.96 billion in 2022, it is projected to reach USD 51.26 billion by 2032.
IT Leaders	Individuals responsible for overseeing the information technology department within an organization.	They are instrumental in adopting innovative technologies like intelligent automation, machine learning, and predictive analytics to enhance business operations.
M		
Machine Learning	A subset of AI that involves the development of algorithms that allow computers to learn from and make decisions based on data.	It is one of the fastest-growing technologies integrated into business initiatives for improved decision-making and efficiency.
N		
Natural Language Processing (NLP)	A field of AI focused on the interaction between computers and humans through natural language.	It enables machines to understand, interpret, and respond to human language, facilitating the automation of tasks that involve unstructured data.
P		
Predictive Analytics	A branch of advanced analytics used to make predictions about future events based on historical data.	It employs statistical algorithms, machine learning techniques, and data mining to identify the likelihood of future outcomes, helping businesses in strategic decision-making.
R		
Robotic Process Automation (RPA)	A technology that uses software robots to automate highly repetitive, routine tasks typically performed by a human.	RPA is a key component of intelligent automation, enhancing productivity and accuracy by handling rule-based processes without human intervention.

REFERENCES

1. A Complete Guide to Natural Language Processing. [Електронний ресурс] // DeepLearning.Ai. — Режим доступу: https://www.deeplearning.ai/resources/natural-language-processing/ (дата звернення: 13.04.2024). — Назва з екрана.
2. A guide to creating a project timeline. [Електронний ресурс] // DeskTime. — Режим доступу: https://desktime.com/blog/project-timeline (дата звернення: 22.04.2024). — Назва з екрана.
3. Automation. [Електронний ресурс] // Britannica. — Режим доступу: https://www.britannica.com/technology/automation (дата звернення: 11.03.2024). — Назва з екрана.
4. Automated industrial production line. [Електронний ресурс] // Sonimat. Europe Technologies group. — Режим доступу: https://sonimat.com/en/automated-production-line/ (дата звернення: 25.05.2024). — Назва з екрана.
5. Automated Production Lines. [Електронний ресурс] // TQC Automation & Test Solutions. — Режим доступу: https://www.tqc.co.uk/automated-production-lines/ (дата звернення: 07.05.2024). — Назва з екрана.
6. Automobile. [Електронний ресурс] // How products are Made. — Режим доступу: http://www.madehow.com/Volume-1/Automobile.html (дата звернення: 30.02.2024). — Назва з екрана.
7. Back to the Future (and the History) of Home Automation. [Електронний ресурс] // HDL. — Режим доступу: https://www.hdlautomation.com/Articles_100000095877533.html (дата звернення: 30.02.2024). — Назва з екрана.
8. Basics of Instrument Remote Control. [Електронний ресурс] // Rohde&Schwarz. — Режим доступу: https://www.rohde-schwarz.com/sg/driver-pages/remote-control/automation-by-remote-control-step-by-step_231238.html (дата звернення: 27.02.2024). — Назва з екрана.
9. Cambridge Dictionary. [Електронний ресурс]. — Режим доступу: https://dictionary.cambridge.org/ (дата звернення: 13.03.2024). — Назва з екрана.
10. Collins English Dictionary. [Електронний ресурс]. — Режим доступу: https://www.collinsdictionary.com/dictionary/english (дата звернення: 13.03.2024). — Назва з екрана.
11. CO2 emissions from EU territorial energy use: -2.8%. [Електронний ресурс] // Eurostat. — Режим доступу: https://alubuild.com/en/what-is-domotics/ (дата звернення: 09.06.2024). — Назва з екрана.
12. Domotics: efficiency and comfort at home. [Електронний ресурс] // Alubuild. — Режим доступу: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/DDN-20230609-2 (дата звернення: 14.07.2024). — Назва з екрана.
13. ERP Definitions. [Електронний ресурс] // TechTarget. — Режим доступу: https://www.techtarget.com/searcherp/definitions (дата звернення: 04.05.2024). — Назва з екрана.
14. Green car technologies explained. [Електронний ресурс] // GreenCarGuide. — Режим доступу: https://www.greencarguide.co.uk/features/green-car-technologies-explained/ (дата звернення: 31.03.2024). — Назва з екрана.

15. Green Car Technologies of the Future. [Електронний ресурс] // Ecobnb. — Режим доступу: https://ecobnb.com/blog/2022/04/green-cars-technologies-future/ (дата звернення: 16.04.2024). — Назва з екрана.

16. How are Cars Assembled. [Електронний ресурс] // Carsblog. — Режим доступу: https://www.dubizzle.com/blog/cars/all-about-car-assembly/ (дата звернення: 15.03.2024). — Назва з екрана.

17. How to Make an Automatic Production Line? [Електронний ресурс] // Lineview. — Режим доступу: https://lineview.com/en/how-to-make-an-automatic-production-line/ (дата звернення: 18.03.2024). — Назва з екрана.

18. How to explain Robotic Process Automation (RPA) in plain English. [Електронний ресурс] // The Enterprises Project. — Режим доступу: https://enterprisersproject.com/article/2019/5/rpa-robotic-process-automation-how-explain (дата звернення: 18.03.2024). — Назва з екрана.

19. Intelligent automation (IA) benefits, components, and examples. [Електронний ресурс] // Zendesk. — Режим доступу: https://www.zendesk.com/blog/ai-automation/# (дата звернення: 20.07.2024). — Назва з екрана.

20. Intelligent Automation Technologies to Have the Most Impact on Digital Businesses. [Електронний ресурс] // AutomationEdge. — Режим доступу: https://automationedge.com/blogs/intelligent-automation-technologies-and-trends/ (дата звернення: 21.03.2024). — Назва з екрана.

21. Intelligent Automation vs Artificial Intelligence: what's the difference? [Електронний ресурс] // Ciklum. — Режим доступу: https://www.ciklum.com/resources/blog/intelligent-automation-vs-artificial-intelligence-whats-the-difference (дата звернення: 28.05.2024). — Назва з екрана.

22. 5 Most Influential Innovators of the 21st Century [Електронний ресурс] // Innovation Management. — Режим доступу: https://innovationmanagement.se/2017/01/31/5-most-influential-innovators-of-the-21st-century/ (дата звернення: 01.05.2024). — Назва з екрана.

23. Nanotechnology spotlight: nano sensors. [Електронний ресурс] // Medium. — Режим доступу: https://medium.com/@helen.chen358/nanotechnology-spotlight-nano-sensors-b82b2a91501a (дата звернення: 13.04.2024). — Назва з екрана.

24. Nanosensors: Definition, Applications and How They Work. [Електронний ресурс] // Azonano. — Режим доступу: https://www.azonano.com/article.aspx?ArticleID=1840(дата звернення: 02.07.2024). — Назва з екрана.

25. Remote control, automation and the lighting industry. [Електронний ресурс] // Eaton. — Режим доступу: https://www.eaton.com/ph/en-us/company/news-insights/lighting-resource/connected-lighting/remote-control-automation-and-the-lighting-industry.html (дата звернення: 20.04.2024). — Назва з екрана.

26. Remote Functions in Industrial Control Systems (ICS). [Електронний ресурс] // Inst Tools. — Режим доступу: https://instrumentationtools.com/remote-functions-in-industrial-control-systems/ (дата звернення: 12.03.2024). — Назва з екрана.

27. Smart Homes vs Traditional Homes. [Електронний ресурс] // Academic B Writing. — Режим доступу: https://edtechbooks.org/academic_b_writing/example_comparison_e (дата звернення: 12.05.2024). — Назва з екрана.

28. 6 Steps to Creating a Beautiful Interactive Timeline (with Download!) [Електронний ресурс] // E-learning Heroes. — Режим доступу: https://community.articulate.com/series/nicole-s-articles/articles/create-interactive-e-learning-timeline (дата звернення: 19.07.2024). — Назва з екрана.

29. 6 Minute English Will robots take our jobs? [Електронний ресурс] // BBC. — Режим доступу: https://www.bbc.co.uk/learningenglish/features/6-minute-english/ep-151015 (дата звернення: 03.06.2024). — Назва з екрана.

30. The Britannica Dictionary. [Електронний ресурс]. — Режим доступу: https://www.britannica.com/dictionary (дата звернення: 13.03.2024). — Назва з екрана.

31. The Path Forward for Intelligent Automation [2024 Trends]. [Електронний ресурс] // Nividous. — Режим доступу: https://nividous.com/blogs/intelligent-automation-trends (дата звернення: 12.05.2024). — Назва з екрана.

32. The Pioneers of Computer Programming. [Електронний ресурс] // Liveworksheets. — Режим доступу: https://www.liveworksheets.com/w/en/english-second-language-esl/1261303 (дата звернення: 10.05.2024). — Назва з екрана.

33. Top 10 Car Technologies In The World. [Електронний ресурс] // Techyv.com. — Режим доступу: https://www.techyv.com/article/top-10-car-technologies-in-the-world/ (дата звернення: 12.05.2024). — Назва з екрана.

34. Your Step-by-Step Guide To Car Manufacturing. [Електронний ресурс] // Khatabook. — Режим доступу: https://khatabook.com/blog/car-manufacturing-process/ (дата звернення: 17.06.2024). — Назва з екрана.

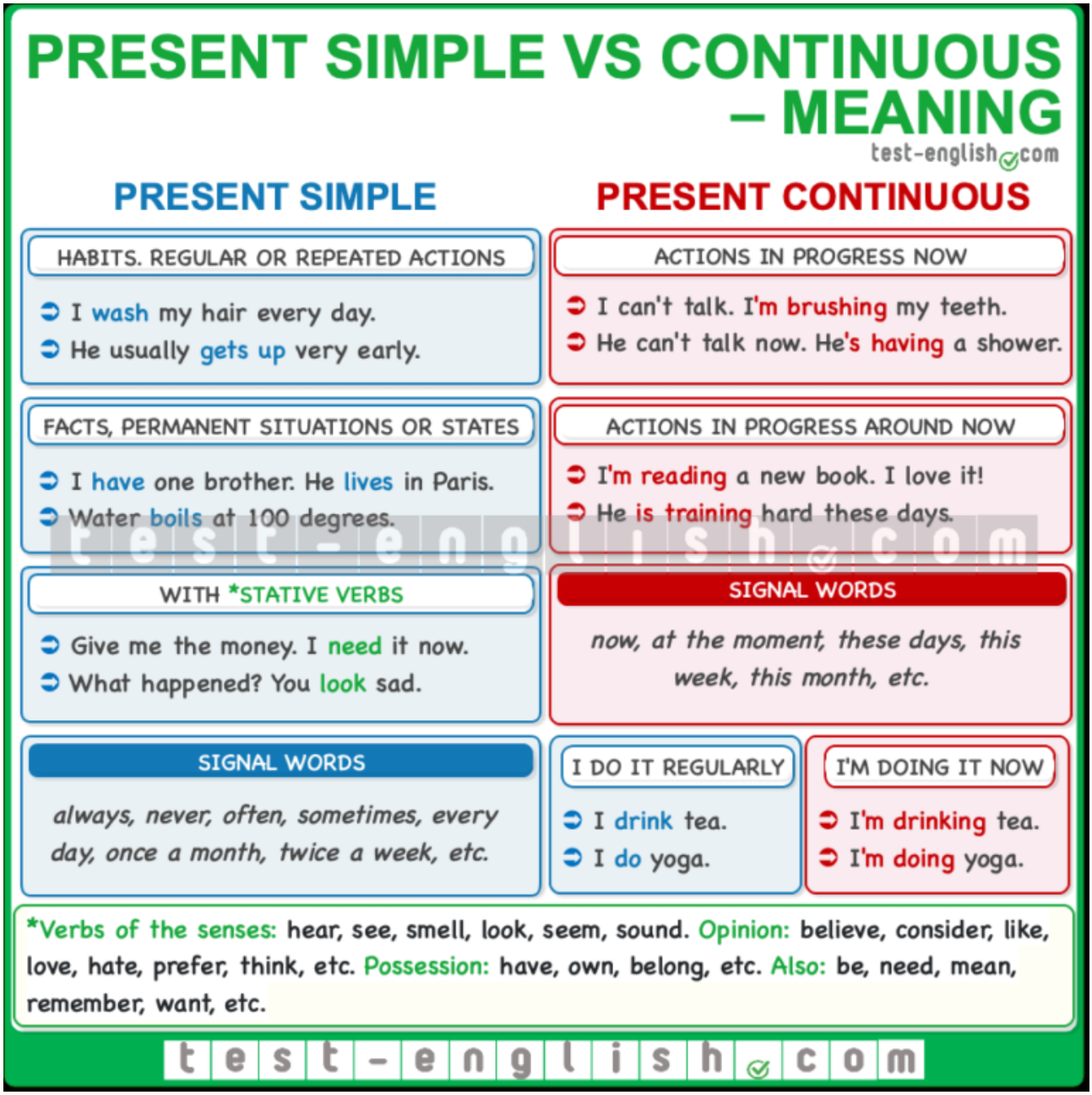
35. What domotics is. [Електронний ресурс] // Easydom. — Режим доступу: https://www.easydom.com/us/what-domotics-is (дата звернення: 27.05.2024). — Назва з екрана.

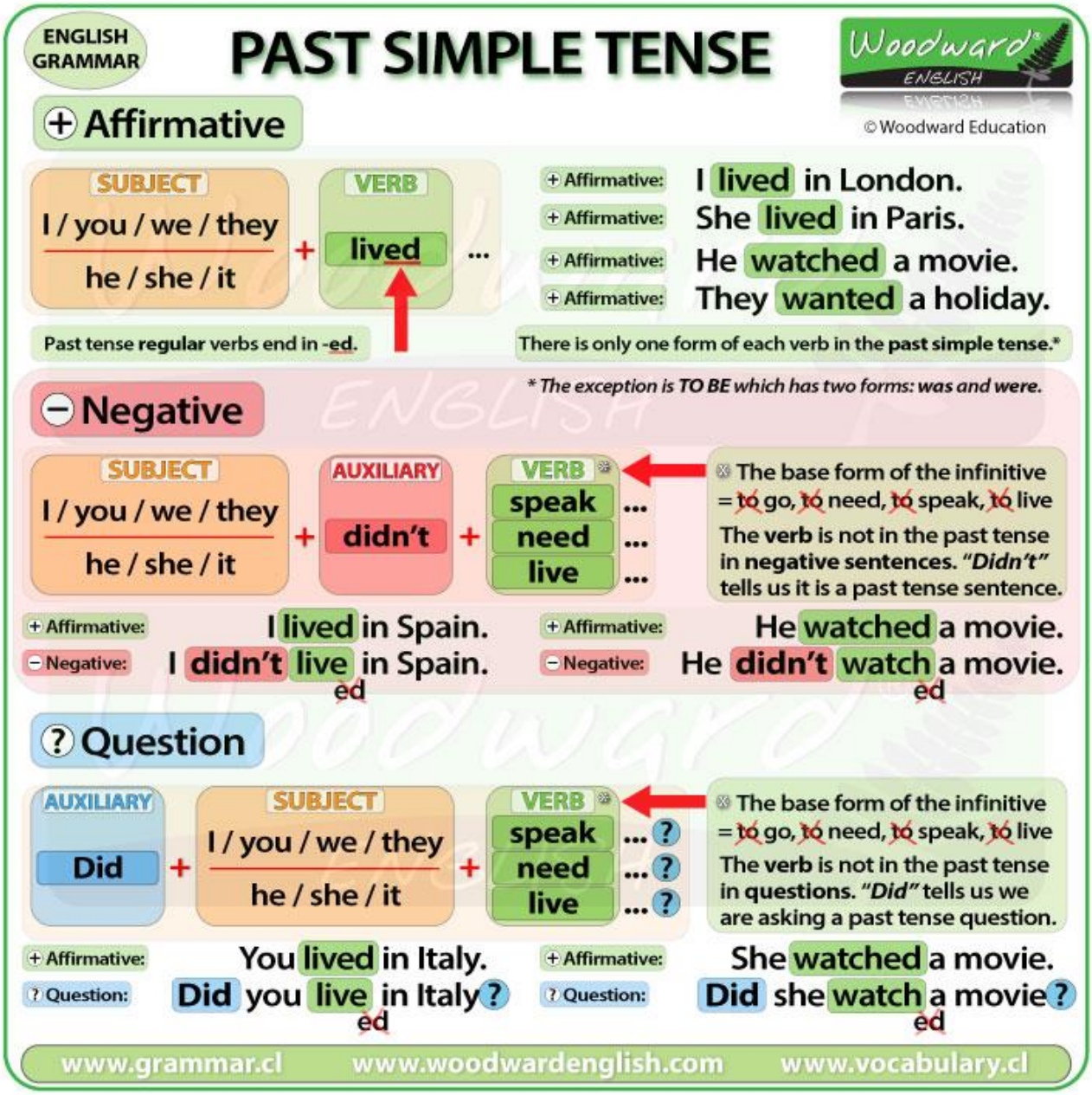
36. What is an automated production line? What types and characteristics are included. [Електронний ресурс] // Linked in. — Режим доступу: https://www.linkedin.com/pulse/what-automated-production-line-types-characteristics-included-zhang (дата звернення: 25.03.2024). — Назва з екрана.

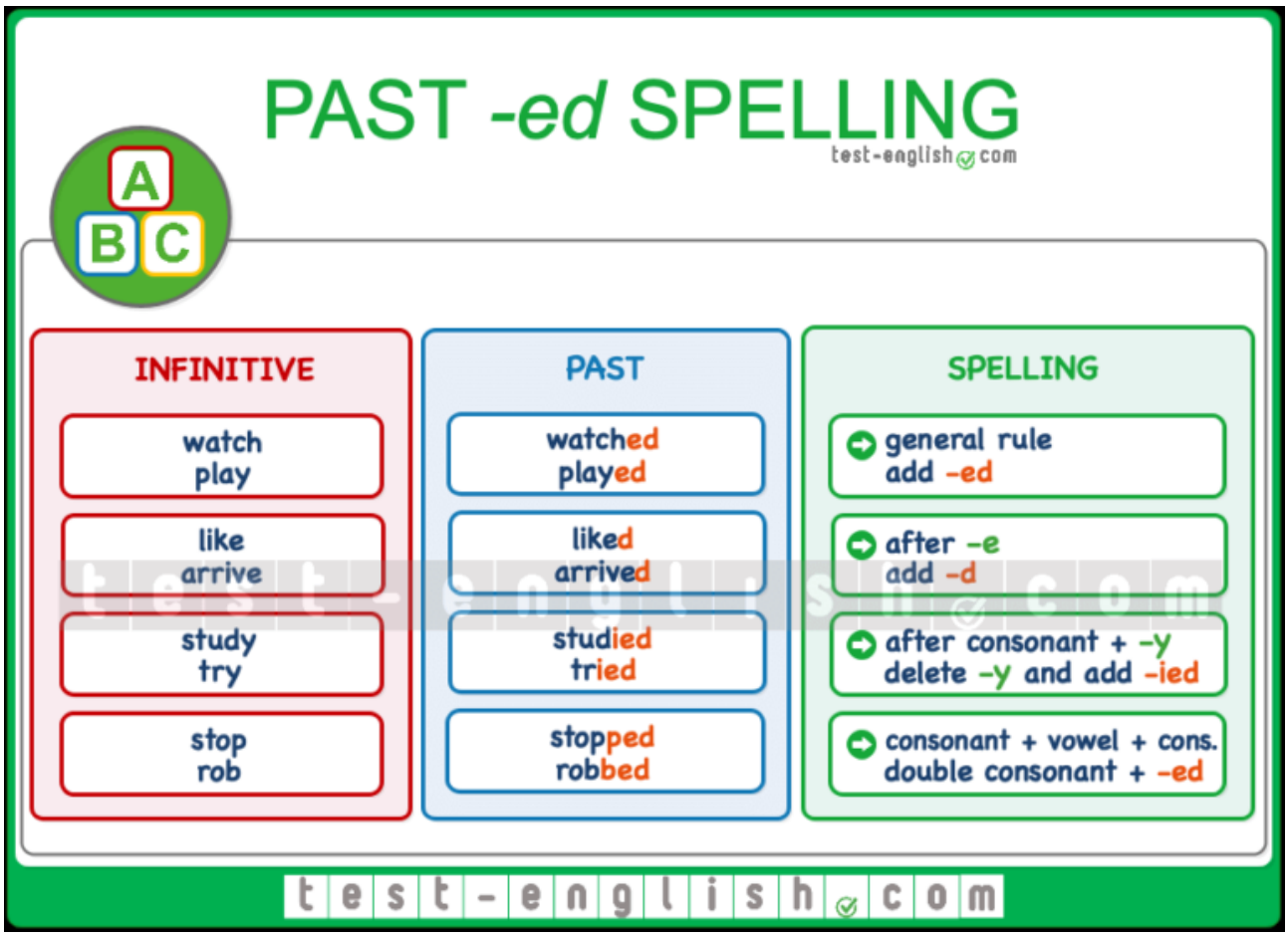
37. What is Communication Automation & How does it Work? [Електронний ресурс] // BotPenguin. — Режим доступу: https://botpenguin.com/blogs/what-is-communication-automation-and-how-does-it-work (дата звернення: 08.04.2024). — Назва з екрана.

38. What Is Intelligent Automation (IA)? [Електронний ресурс] // Builtin. — Режим доступу: https://builtin.com/artificial-intelligence/intelligent-automation (дата звернення: 01.04.2024). — Назва з екрана.

39. Why Businesses are using Intelligent Automation. [Електронний ресурс] // Bjss. — Режим доступу: https://www.bjss.com/articles/why-businesses-are-using-intelligent-automation (дата звернення: 01.04.2024). — Назва з екрана.


PRESENT SIMPLE VS CONTINUOUS – MEANING
test-english.com
PRESENT SIMPLE
PRESENT CONTINUOUS
HABITS. REGULAR OR REPEATED ACTIONS
I wash my hair every day.
He usually gets up very early.
ACTIONS IN PROGRESS NOW
I can't talk. I'm brushing my teeth.
He can't talk now. He's having a shower.
FACTS, PERMANENT SITUATIONS OR STATES
I have one brother. He lives in Paris.
Water boils at 100 degrees.
ACTIONS IN PROGRESS AROUND NOW
I'm reading a new book. I love it!
He is training hard these days.
WITH *STATIVE VERBS
Give me the money. I need it now.
What happened? You look sad.
SIGNAL WORDS
now, at the moment, these days, this week, this month, etc.
SIGNAL WORDS
always, never, often, sometimes, every day, once a month, twice a week, etc.
I DO IT REGULARLY
I drink tea.
I do yoga.
I'M DOING IT NOW
I'm drinking tea.
I'm doing yoga.
*Verbs of the senses: hear, see, smell, look, seem, sound. Opinion: believe, consider, like, love, hate, prefer, think, etc. Possession: have, own, belong, etc. Also: be, need, mean, remember, want, etc.
test-english.com


ENGLISH GRAMMAR
PAST SIMPLE TENSE
Woodward ENGLISH
© Woodward Education
⊕ Affirmative
SUBJECT
I / you / we / they
he / she / it
+
VERB
lived
...
⊕ Affirmative: I lived in London.
⊕ Affirmative: She lived in Paris.
⊕ Affirmative: He watched a movie.
⊕ Affirmative: They wanted a holiday.
Past tense regular verbs end in -ed.
There is only one form of each verb in the past simple tense.*
* The exception is TO BE which has two forms: was and were.
⊖ Negative
SUBJECT
I / you / we / they
he / she / it
+
AUXILIARY
didn't
+
VERB
speak ...
need ...
live ...
The base form of the infinitive = to go, to need, to speak, to live
The verb is not in the past tense in negative sentences. "Didn't" tells us it is a past tense sentence.
⊕ Affirmative: I lived in Spain.
⊖ Negative: I didn't live in Spain.
ed
⊕ Affirmative: He watched a movie.
⊖ Negative: He didn't watch a movie.
ed
? Question
AUXILIARY
Did
+
SUBJECT
I / you / we / they
he / she / it
+
VERB
speak ...?
need ...?
live ...?
The base form of the infinitive = to go, to need, to speak, to live
The verb is not in the past tense in questions. "Did" tells us we are asking a past tense question.
⊕ Affirmative: You lived in Italy.
? Question: Did you live in Italy?
ed
⊕ Affirmative: She watched a movie.
? Question: Did she watch a movie?
ed
www.grammar.cl
www.woodwardenglish.com
www.vocabulary.cl



Past Simple - 'to be'						Grammar Wiz
	Question word	**Subject**	was / were	*wasn't / weren't*	**Subject**	**Complement**
Affirmative		They The house	were was			tired hot
Negative		We John		weren't wasn't		scared confident
Question	(Where) (Why) (Why)		was were	 wasn't	Susan? they he	 late? upset?

IRREGULAR VERBS A1 - PAST

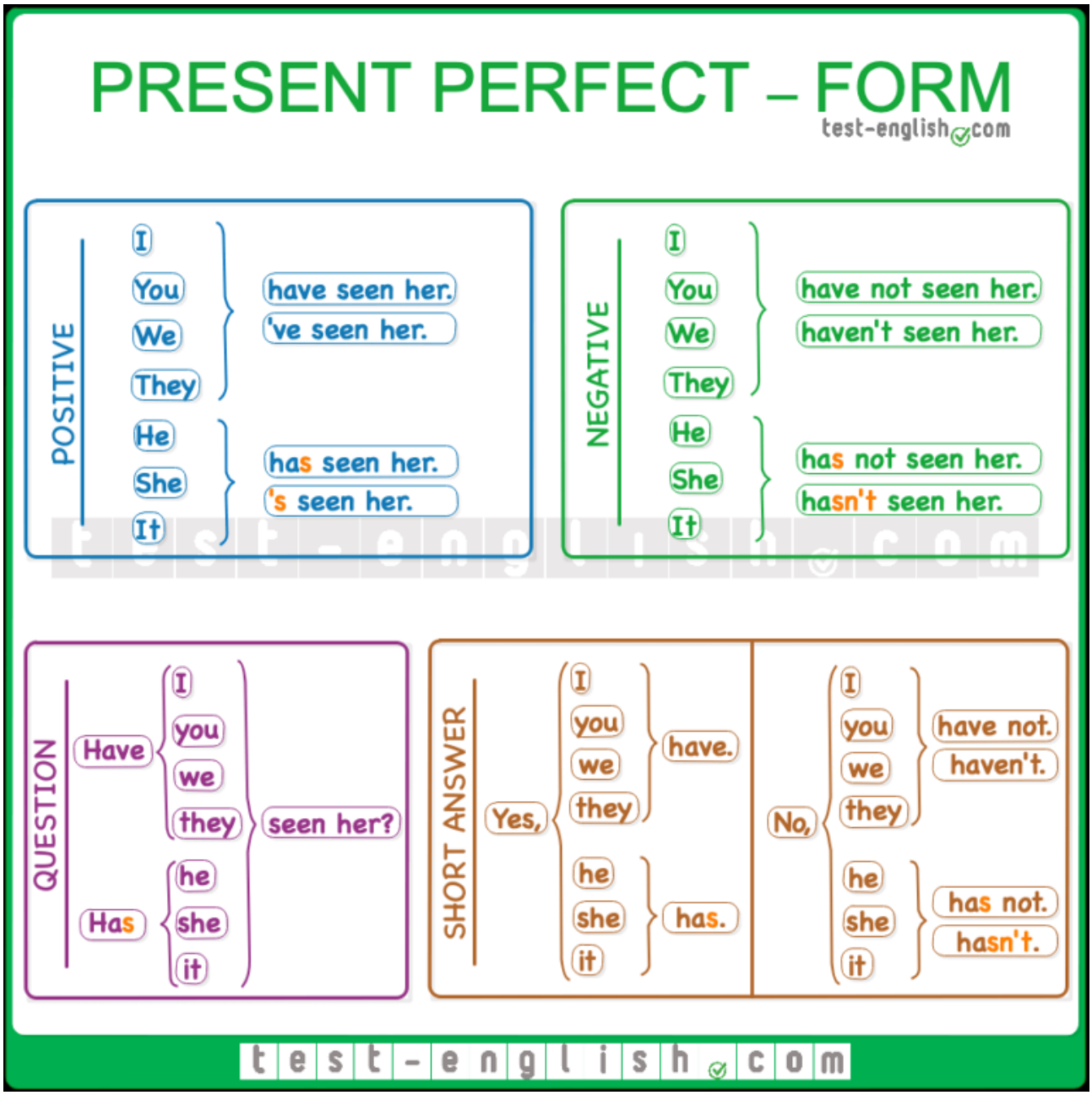
test-english.com

BE	WAS/WERE	We were at home all day yesterday.
BEGIN	BEGAN	At the end of the scene, we began to cry.
BREAK	BROKE	I broke my arm in an accident.
BRING	BROUGHT	Who brought you here?
BUY	BOUGHT	He bought a new car last week.
DO	DID	I did some shopping.
DRINK	DRANK	He drank a lot of water after the match.
DRIVE	DROVE	We drove to the airport.
EAT	ATE	We ate paella by the beach.
FIND	FOUND	I finally found the keys.
FLY	FLEW	We flew to Zurich last summer.
FORGET	FORGOT	I forgot the keys in the house.
GET	GOT	She got a lot of presents for her birthday.
GIVE	GAVE	I was cold and he gave me a jacket.
GO	WENT	I went to work by bus yesterday.
HAVE	HAD	I had a lot of toys as a child.
KNOW	KNEW	We knew that he was special immediately.
LOSE	LOST	He lost his wallet at the airport.
MAKE	MADE	They made a cake for the party.
MEET	MET	I met my wife at a wedding.
PAY	PAID	She paid for the drinks.
PUT	PUT	I put the ice cream in the freezer.
READ	READ	I read a very interesting article yeserday.
RUN	RAN	When the fire started, we ran.
SAY	SAID	She said something in his ear.
SEE	SAW	We saw a very strange man in the street.
SELL	SOLD	Peter sold me his old car.
SEND	SENT	People sent lots of letters in the past.
SING	SANG	Everybody sang "Happy birthday" to her.
SIT	SAT	We sat on the sand and looked at the sea.
SLEEP	SLEPT	I only slept four hours last night.
SPEAK	SPOKE	We spoke to our kid's teacher last week.
SPEND	SPENT	We spent a lot of money during our last trip.
SWIM	SWAM	He swam in the sea in December.
TAKE	TOOK	Somebody took my things.
TEACH	TAUGHT	She taught me how to play the drums.
TELL	TOLD	I told him to go home.
THINK	THOUGHT	We thought you were dead.
UNDERSTAND	UNDERSTOOD	I understood her decision.
WEAR	WORE	Sara wore a beautiful red dress at the party.
WIN	WON	They won the match.
WRITE	WROTE	I wrote a letter to the manager.

Future Tense

Future Simple		
Affirmative	Subject + Will + Verb + object	I will call you after dinner.
Negative	Subject + will not (won't) + Verb + object	He will not (won't) come here.
Question	Will + subject + Verb + object?	Will she join our music band?
Future Continuous		
Affirmative	Subject + will be + Verb (-ing) + Object	We will be making pizza tonight.
Negative	Subject + will not (won't) be + Verb (-ing) + Object	She will not (won't) be staying with us.
Question	Will + Subject + Be + Verb (-ing) + Object?	Will John be working on this project with us?
Future Perfect		
Affirmative	Subject + Will have + Verb (past participle) + Object	I will have done this work by the evening.
Negative	Subject + Will not (won't) have + Verb (past participle) + Object	Your parents will not (won't) have heard this news yet.
Question	Will + Subject + have + Verb (past participle) + Object?	Will Olivia have left the office by now?
Future Perfect Continuous		
Affirmative	Subject + will have + been + Verb (-ing) + Object	I will have been working for 12 hours by midnight.
Negative	Subject + will not (won't) have been + Verb (-ing) + Object	Mr. Smith will not (won't) have been teaching us.
Question	Will + Subject + have been + Verb (-ing) + Object?	Will you have been living in this city for two years by next month?


OTHER WAYS TO EXPRESS FUTURE
test-english.com
1
BE ABOUT TO + infinitive
The new app for electronic payments is about to be launched.
2
BE ON THE BRINK/POINT/VERGE OF + -ing
Artificial Intelligence is on the verge of revolutionising the world.
3
BE TO + infinitive
The president is to sign the agreement before he leaves office.
4
BE DUE TO + infinitive
They are due to leave the country next week when their visas expire.
5
BE (UN)LIKELY TO/THAT
He's bad. He is unlikely to win the match.
It's unlikely that he will win the match.
test-english.com


PRESENT PERFECT – FORM
test-english.com
POSITIVE
I
You
We
They
have seen her.
've seen her.
He
She
It
has seen her.
's seen her.
NEGATIVE
I
You
We
They
have not seen her.
haven't seen her.
He
She
It
has not seen her.
hasn't seen her.
QUESTION
Have
I
you
we
they
Has
he
she
it
seen her?
SHORT ANSWER
Yes,
I
you
we
they
have.
he
she
it
has.
No,
I
you
we
they
have not.
haven't.
he
she
it
has not.
hasn't.
test-english.com

PRESENT PERFECT – MEANING

test-english.com

PAST RECENT EVENTS
We don't say when. Or with time expressions including now.

She's had an accident.
I've passed the exam.

- JUST, ALREADY, YET — "Have you finished yet?" "Yes, I've already finished."
- RECENTLY — Have you seen any good films recently?
- TODAY, THIS WEEK, THIS MONTH, ETC. — I haven't seen Ted today. Maybe he isn't feeling well.

PAST EXPERIENCES
We don't say when these events happened.

We've been to Rome and Florence.
I haven't read that book.

- NEVER, EVER, BEFORE — "Have you ever read it?" "I have never read it."
- Superlative + EVER — This is the best food I've ever tried.
- Number of times until now — I've seen this film three times.

UNFINISHED SITUATIONS
Situations that started in the past and have not finished.

How long have you been here?
I have been here all day.

- HOW LONG, FOR, SINCE — We have been married for 20 years.
- ALL + time expression — I've lived in this house all my life.
- LATELY — We have been very busy lately.

test-english.com

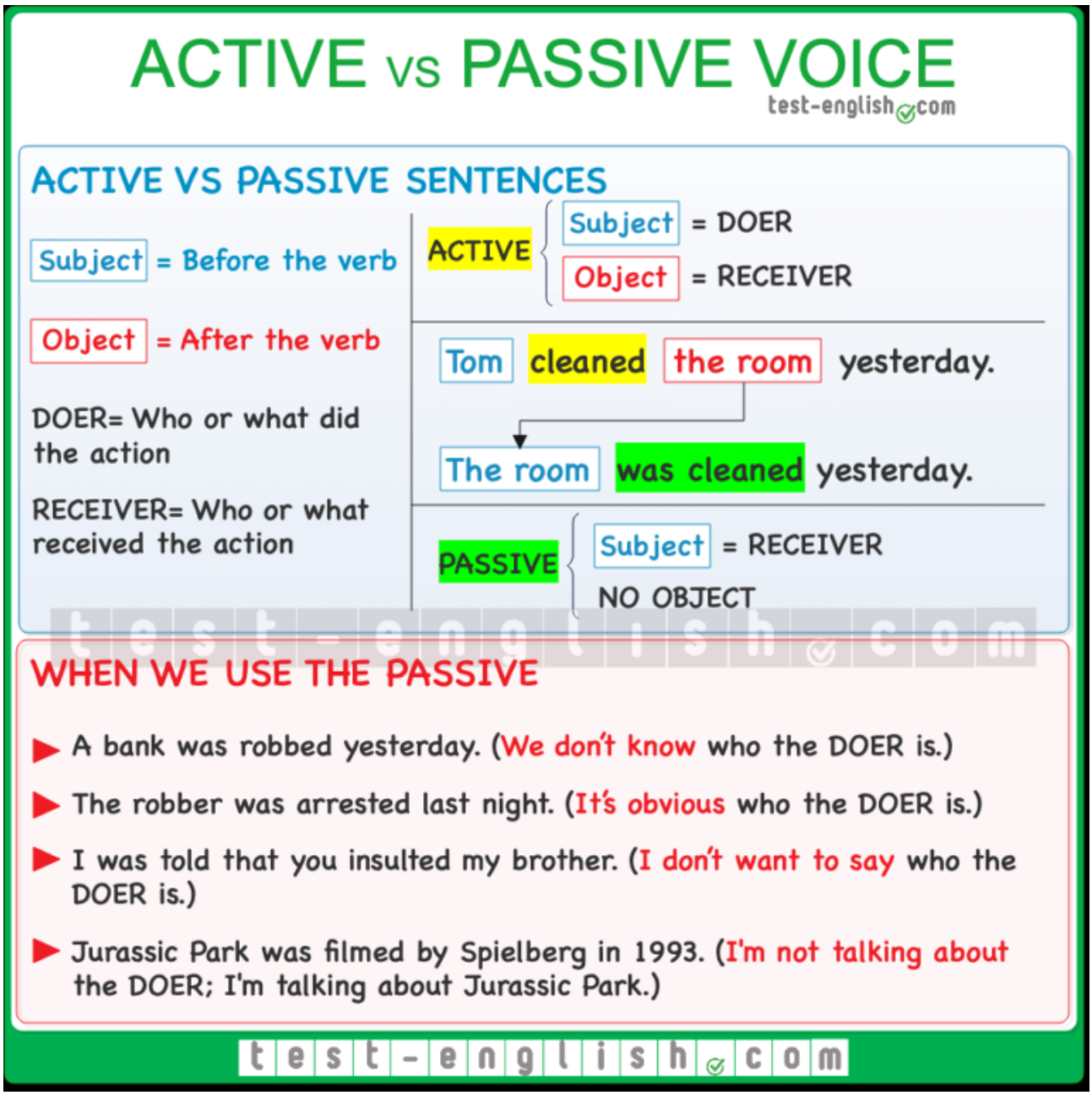
Present Perfect with for, since

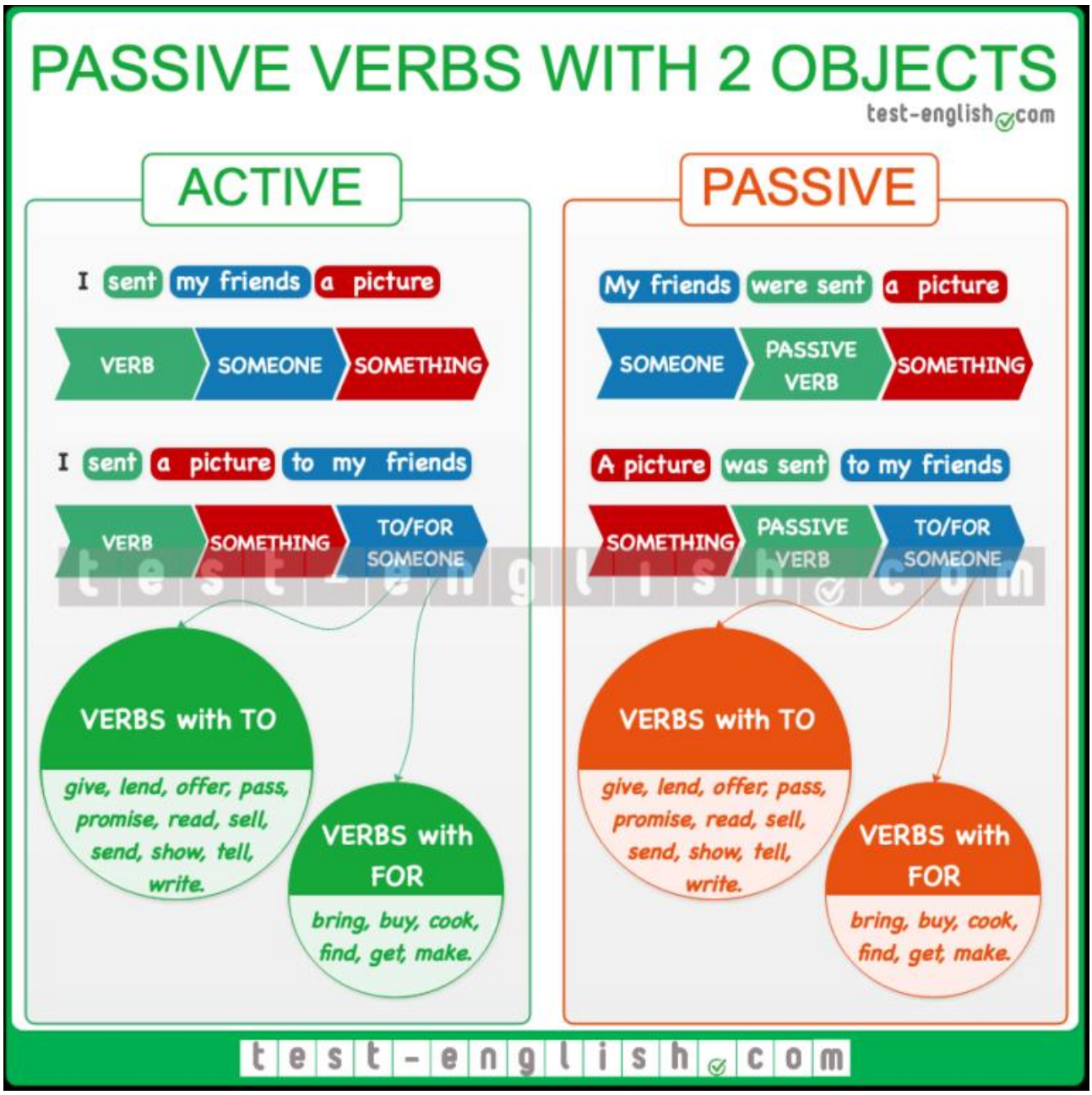
for	since
five years	yesterday
seven months	this afternoon
three weeks	this morning
a night	Monday
eight days	five clock
two hours	2003
a couple of days	he was in school
ten seconds	I met her

I have studied **for** three hours.

I have been studying **since** 9:00.


PRESENT PERFECT vs PAST SIMPLE
test-english.com
WE DON'T SAY WHEN STH HAPPENED (IT'S RELEVANT NOW)
I've finished my essay. (It's done now.)
He has left. (He's not here now.)
WE SAY OR ASK WHEN STH HAPPENED
When did you finish your essay?
He left after the game.
I didn't go to work yesterday.
WE MENTION A PAST EXPERIENCE OR RECENT EVENT
She has won two gold medals.
I've broken my arm.
They have travelled a lot.
WE ASK ABOUT OR GIVE THE DETAILS
She has won two gold medals. She got the first one in Tokyo and...
"I've broken my arm." "How did it happen?" "I fell in the park."
UNFINISHED TIME
He has lived in Japan for years. (=He still lives in Japan.)
How long have you been married? (=You are still married.)
FINISHED TIME
He lived in Japan for years. (=He does not live in Japan now.)
How long were your married? (=You aren't married anymore.)
test-english.com


ACTIVE vs PASSIVE VOICE
test-english.com
ACTIVE VS PASSIVE SENTENCES
Subject = Before the verb
Object = After the verb
DOER= Who or what did the action
RECEIVER= Who or what received the action
ACTIVE
Subject = DOER
Object = RECEIVER
Tom cleaned the room yesterday.
The room was cleaned yesterday.
PASSIVE
Subject = RECEIVER
NO OBJECT
test-english.com
WHEN WE USE THE PASSIVE
A bank was robbed yesterday. (We don't know who the DOER is.)
The robber was arrested last night. (It's obvious who the DOER is.)
I was told that you insulted my brother. (I don't want to say who the DOER is.)
Jurassic Park was filmed by Spielberg in 1993. (I'm not talking about the DOER; I'm talking about Jurassic Park.)
test-english.com


PASSIVE VERBS WITH 2 OBJECTS
test-english.com
ACTIVE
I sent my friends a picture
VERB
SOMEONE
SOMETHING
I sent a picture to my friends
VERB
SOMETHING
TO/FOR SOMEONE
VERBS with TO
give, lend, offer, pass, promise, read, sell, send, show, tell, write.
VERBS with FOR
bring, buy, cook, find, get, make.
PASSIVE
My friends were sent a picture
SOMEONE
PASSIVE VERB
SOMETHING
A picture was sent to my friends
SOMETHING
PASSIVE VERB
TO/FOR SOMEONE
VERBS with TO
give, lend, offer, pass, promise, read, sell, send, show, tell, write.
VERBS with FOR
bring, buy, cook, find, get, make.
test-english.com


PASSIVE VOICE – ALL TENSES
test-english.com
ACTIVE
PASSIVE
They take the photos
PRESENT SIMPLE
The photos are taken
They are taking the photos
PRESENT CONTINU.
The photos are being taken
They have taken the photos
PRESENT PERFECT
The photos have been taken
They took the photos
PAST SIMPLE
The photos were taken
They were taking the photos
PAST CONTINUOUS
The photos were being taken
They had taken the photos
PAST PERFECT
The photos had been taken
They will take the photos
FUTURE
The photos will be taken
They are going to take the photos
BE GOING TO
The photos are going to be taken
They will have taken the photos
FUTURE PERFECT
The photos will have been taken
to take
INFINITIVE
to be taken
to have taken
PERFECT INFINITIVE
to have been taken
taking
GERUND
being taken
test-english.com

INFINITIVE vs GERUND

test-english.com

USE -*ING* VERB

As the subject of a sentence

- Cheating is not allowed.
- Eating candy is bad for your teeth.

After a preposition

- I'm tired of waiting for you.
- He's very good at painting.

After certain verbs
⇨ SEE VERB LIST BELOW

- I don't mind waiting.
- She recommended eating here.

⇨ VERBS + *ING*

avoid, enjoy, finish, hate, keep, like, love, (don't) mind, prefer, recommend, spend time, stop, suggest, etc.

Negative form: *NOT* + verb-*ING*

- I love not having to go to work.
- I hate not hearing from you.

USE BARE INFINITIVE

After *do, does, did* in negative sentences and questions

- He didn't say anything.
- Does Tim work with you?

After modal verbs: *will, can, must, should, etc.*

- You should come with us.
- I can't play the guitar.

USE *TO*-INFINITIVE

To express purpose (why?)

- I went to Madrid to visit some family.
- I need more time to study for the exam.

After *be* + adjective

- It's important to arrive early at the station.
- I'm glad to see you.

After *what, where, when, why, etc.*

- I don't know what to eat.
- I want to learn how to play the guitar.

After certain verbs
⇨ SEE VERB LIST BELOW

- Don't forget to call me when you get home.
- She seems to be distracted.

⇨ VERBS + *TO* INFINITIVE

decide, forget, help, hope, learn, need, offer, plan, promise, remember, seem, try, want, would like, would love, would hate, would prefer, etc.

Negative form: *NOT* + *TO* + infinitive

- She decided not to enter the competition.
- I promise not to lie again.

Навчальне видання

СВИСЮК Олена Вікторівна

FLUENT IN AUTOMATION:
ESSENTIAL ENGLISH FOR FUTURE ENGINEERS

навчальний посібник з англійської мови для студентів спеціальності 174 «Автоматизація, комп'ютерно-інтегровані технології та робототехніка»

Електронне видання

Комп'ютерний дизайн та верстка: Свисюк О. В.

Гарнітура Times.
Умовн. друк. арк. 22,79

Державний університет «Житомирська політехніка»

м. Житомир, вул. Чуднівська, 103