Міністерство освіти і науки України

Національний університет водного господарства
та природокористування

Кафедра іноземних мов

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МЕТОДИЧНІ ВКАЗІВКИ
та навчальні завдання
з розвитку англомовного професійного спілкування
до практичних занять і самостійної роботи
для здобувачів вищої освіти першого (бакалаврського)
рівня за освітньо-професійною програмою
«Автоматизація, комп'ютерно-інтегровані технології та
робототехніка»
спеціальності 174 «Автоматизація,
комп'ютерно-інтегровані технології та робототехніка»
денної та заочної форм навчання

Рівне – 2024

Методичні вказівки та навчальні завдання з розвитку англомовного професійного спілкування до практичних занять і самостійної роботи для здобувачів вищої освіти першого (бакалаврського) рівня за освітньо-професійною програмою «Автоматизація, комп'ютерно-інтегровані технології та робототехніка» спеціальності 174 «Автоматизація, комп'ютерно-інтегровані технології та робототехніка» денної та заочної форм навчання [Електронне видання] / Озарчук І. В., Осіпчук Н. В. – Рівне : НУВГП, 2024. – 54 с.

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Зміст

Передмова

Іноземна мова – інструмент міжкультурного спілкування та засіб пізнання світової культури. Саме тому важливим етапом вивчення мови є формування мовленнєвих компетентностей, головні аспекти яких:

Читання – вміння читати тексти, аналізувати їх та робити власні висновки, розуміти логічні зв'язки в рамках тексту й між його окремими частинами.

Говоріння – вміння вільно висловлюватися та вести бесіду в межах вивчених тем, гнучко й ефективно користуючись мовними та мовленнєвими засобами.

Письмо – вміння надати в письмовому вигляді інформацію у відповідності з комунікативним завданням та висловити власне ставлення до проблеми, правильно використовуючи лексичні одиниці та граматичні структури.

Аудіювання – вміння розуміти тривале мовлення і основний зміст повідомлень, сприймати на слух подану інформацію.

Формування професійних мовленнєвих компетентностей студентів є предметом «Методичних вказівок та навчальних завдань для розвитку професійних мовленнєвих компетентностей до практичних занять і для самостійної роботи з навчальної дисципліни «Іноземна мова (англійська)» для здобувачів першого (бакалаврського) рівня вищої освіти, які навчаються за освітньо-професійною програмою «Автоматизація та комп'ютерно-інтегровані технології)».

Метою методичних вказівок та навчальних завдань є формування і розвиток умінь адекватно й правильно використовувати мову на практиці.

У процесі опрацювання матеріалу та виконання комплексу вправ досягається *розвиток таких умінь студентів*:

Ефективне спілкування (вміння дискутувати, аргументувати свою точку зору, розуміти усне та письмове мовлення співрозмовників).

Особистий розвиток (розширення кругозору та знань про світ; розвиток критичного мислення й аналітичних здібностей; відкриття нових можливостей).

Академічна успішність (покращення навичок читання та письма англійською мовою).

Професійний розвиток (підвищення конкурентоспроможності

на ринку праці; здатність до ефективної комунікації з іноземними партнерами чи клієнтами).

Матеріали посібника дають уявлення про специфіку професійної діяльності майбутнього спеціаліста автоматизації та комп'ютерно-інтегрованих технологій, розширюють знання, отримані студентами при вивченні фахових предметів. Дана методична розробка спрямована на практичне вивчення мовних структур і лексики, необхідних для ефективної комунікації в академічному та професійному середовищі, зокрема під час практичних занять і самостійної роботи.

Unit 1. Introduction to Computer Engineering.
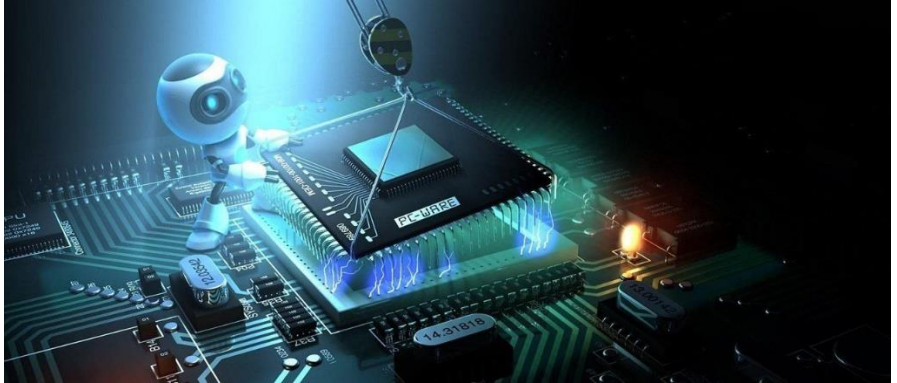
VOCABULARY

Task 1. Match the words with their definitions.

1. automation	a. a machine capable of carrying out complex tasks automatically.
2. robot	b. The process of combining different systems or components to work together.
3. sensor	c. The ability to accomplish a job with a minimum expenditure of time and effort.
4. actuator	d. The programs and other operating information used by a computer.
5. controller	e. The use of technology to perform tasks without human intervention.
6. software	f. A component of a machine that is responsible for moving or controlling a mechanism or system.
7. processor	g. A device that directs the operation of a machine or system.
8. ram	h. A set of connected things or parts forming a complex whole.
9. network	i. A device that detects or measures a physical property and records, indicates, or responds to it.
10. system	j. The quality of being trustworthy or performing consistently well.

11. integration	k. The quantity of goods and services produced from each unit of labor input.
12. reliability	l. An advantage or profit gained from something.
13. efficiency	m. The primary circuit board in a computer that connects all components.
14. productivity	n. A system software that manages computer hardware and software resources.
15. benefit	o. A set of computers connected together for sharing resources.
16. motherboard	p. The main component that performs calculations and executes instructions.
17. operating system	q. The memory used by a computer to store data temporarily.

WRITING

Task 2. Complete the sentences using the correct vocabulary word from the list.

1. The _____ of different technologies can improve the overall performance of a production line.

2. In an automated system, a _____ is used to measure physical properties like temperature or pressure.

3. A _____ directs the operations of various machines in an integrated system.

4. One of the main advantages of _____ is that it reduces the need for human intervention in repetitive tasks.

5. The _____ controls the movement of the robotic arm in an assembly line.

6. The _____ used in the new system has made it more efficient and user-friendly.

7. To achieve greater _____, manufacturers often implement automated processes.

8. _____ is critical for systems that need to operate continuously without failure.

9. The manufacturing _____ includes various machines and equipment working together.

10. A _____ can perform tasks that are dangerous or difficult for humans. 1. Integration

Task 3. Read the text and answer the questions.

Automation and Computer-Integrated Technologies

Automation refers to the use of machines and technology to make processes operate without human intervention. It is used in many industries, including manufacturing, transportation, and healthcare. Automation can improve efficiency, reduce errors, and save costs.

Fully compatible with many HR and ERP platforms, a Process Automation service does not replace your existing systems – but just like Information Management, works as an add-on that fills gaps in your functionality. Give time back to your data handlers, with software that can automatically extract, process, and file data from invoices, job applications, and e-forms; all with minimal input required from your employees. There are 4 benefits of Process Automation. Many benefits are created by engaging with a Process Automation service, even before your workflows are configured with additional commands. ☑ Accuracy All But Assured ☑ Familiar Program, Boosted Efficiency ☑ Workflow Tutorials Upon Request ☑ Customisable for Your Convenience

One key area of automation is the use of robots. Robots are machines designed to perform specific tasks. In factories, robots are used to assemble products, weld parts, and handle materials. They can work faster and more accurately than humans, which increases productivity.

Computer-integrated technologies involve the use of computers to control and monitor various processes. This can include anything from managing the production line in a factory to monitoring patient health in a hospital. These technologies allow for better data collection and analysis, which leads to more informed decision-making.

For example, in the automotive industry, computer-integrated technologies are used to design cars, manage supply chains, and ensure quality control. By using these technologies, companies can produce better products more efficiently.

While automation and computer-integrated technologies offer many benefits, they also present challenges. One major challenge is the potential loss of jobs as machines replace human workers. Additionally, there are concerns about data security and privacy as more information is collected and stored electronically.

Despite these challenges, the future of automation and computer-integrated technologies is promising. They continue to evolve and improve, offering new opportunities for innovation and growth. (*Taken from*: What is automation? https://www.youtube.com/watch?v=Poxi42XYuXc)

1. What is automation, and in which industries is it commonly used?
2. How does Process Automation integrate with existing HR and ERP platforms?
3. What are the four benefits of engaging with a Process Automation service?
4. In what ways are robots used in factories?
5. How do computer-integrated technologies contribute to decision-making in industries?
6. What role do computer-integrated technologies play in the automotive industry?
7. What are some of the challenges associated with automation and computer-integrated technologies?
8. What is the future outlook for automation and computer-integrated technologies?

Task 4. Read the statements and decide if they are true (T) or false (F).
1. Automation can help reduce errors in processes. ( )
2. Robots in factories can only assemble products. ( )
3. Computer-integrated technologies are not used in healthcare. ( )
4. Using computers can help companies make better decisions. ( )
5. One challenge of automation is the potential loss of jobs. ( )
6. There are no concerns about data security in automation. ( )

SPEAKING

Task 5. Answer the questions in full sentences.
1. What are some advantages of automation?
2. How are robots used in factories?
3. Why are computer-integrated technologies important in healthcare?
4. What are some challenges of automation?
5. How does software integration contribute to automation?

Task 6. Complete the sentences using the vocabulary.

Software, controller, robots, integration sensor, automation, network, actuator, software, management.

1. The _____ helps ensure that the machine operates according to the desired parameters.

2. In a modern factory, _____ are used to automate the production process.

3. The _____ measures temperature and adjusts the system accordingly.

4. High _____ in manufacturing processes can lead to increased productivity and reduced costs.

5. The _____ connects all parts of the automated system, allowing them to work together seamlessly.

6. To move the robotic arm, the system uses an _____ .

7. The _____ used in this new technology ensures it performs consistently well over time.

8. _____ is essential to combine different technologies into a cohesive system.

9. The company' s new _____ allowed them to create more complex designs for their products.

10. Effective _____ is critical for the successful implementation of automated systems.

Task 7. Choose the correct answer for each question.

1. What is the primary purpose of automation?
    a) To increase human labor
    b) To perform tasks without human intervention
    c) To complicate processes
    d) To decrease efficiency

2. Which device measures physical properties like temperature and pressure?
    a) Actuator   *b) Controller*
    c) Sensor   *d) Software*

3. What does a controller do in an automated system?
    a) Detects changes in the environment
    b) Moves parts of a machine
    c) Directs the operation of the system

d) Provides power to the system

4. What is one of the main benefits of automation in manufacturing?

  a) Increased manual labor b) Higher efficiency
  c) Greater need for supervision
  d) Slower production times

5. Which of the following is essential for components to work together in an automated system?

  a) Isolation b) Integration
  c) Disconnection d) Separation

SPEAKING

Task 8. Prepare a short presentation (2-3 minutes) on one of the following topics. Use simple language and try to include examples to illustrate your points. After your presentation, be ready to answer a few questions from your groupmates or teacher.
Topics:

1. The Role of the Processor in a Computer.
2. The Difference Between Hardware and Software.
3. How Networks Connect and Communicate.
4. The Importance of Operating Systems.
5. Emerging Trends in Computer Engineering.

LISTENING

Task 9. Listen to people discussing this question and do the tasks. Do the preparation task first below the video. What role does technology play in your life?

https://learnenglish.britishcouncil.org/general-english/video-zone/technology-daily-lives

WRITING

Task 10. Write a short paragraph (4-5 sentences) about the importance of computer engineering in today' s world. Use the following words: technology, innovation, development, systems, problem-solving.

Unit 2. Types of Automation.

Task I. Match the term with its definition:

1. fixed Automation	a. Automation designed for high-volume production where the sequence of operations is unchanging.
2. programmable Automation	b. Automation that can be reprogrammed to handle different tasks or products.
3. flexible Automation	c. Automation systems that can handle different products without significant reprogramming.
4. industrial Automation	d. Use of control systems like computers and robots in industrial processes.
5. office Automation	e. Use of computers and software to perform office tasks.
6. home Automation	f. Use of the internet and smart devices to control home appliances.
7. IT Process Automation	g. Automation of IT tasks and workflows.
8. assembly Line	h. A production process that breaks the manufacture of a good into steps that are completed in a pre-defined

	sequence.
9. CNC Machine	i. Computer Numerical Control machine, used in programmable automation for manufacturing.
10. FMS (Flexible Manufacturing System)	j. A production system that can handle various products with minimal reconfiguration.
11. PLCs (Programmable Logic Controllers)	k. Industrial digital computers used for automation of manufacturing processes.
12. batch processing	l. Processing of data or production in batches.
13. smart thermostat	m. A device that can automatically adjust the temperature of a home.
14. network management	n. The process of administering and managing computer networks of manufacturing processes.

WRITING

Task 2. Fill in the gaps.

Machines, mass, batch, changeover, hardware, operations, smart devices.

1. Fixed automation is used for _____ production.

2. Programmable automation is suitable for _____ production.

3. Flexible automation can handle a variety of products without significant _____ .

4. Industrial automation involves the use of _____ and robots.

5. Office automation makes use of _____ and software.

6. Home automation involves the control of home appliances using _____ .

7. IT process automation manages IT tasks and _____ .

Task 3. Read the text and answer the questions.

Automation, a cornerstone of modern industry and daily life, can be classified into several types based on complexity, flexibility, and application. Each type serves distinct purposes, catering to the specific needs of various industries, from manufacturing to home management. Understanding these different types of automation is crucial for optimizing processes, reducing costs, and improving efficiency.

Fixed Automation

Fixed automation, also known as hard automation, is designed for high-volume production where the sequence of processing operations is pre-determined and remains constant over time. This type of automation is typically used in environments that require repetitive tasks with little to no variation in the product, making it ideal for mass production. Industries such as automotive manufacturing, where assembly lines produce thousands of identical vehicles, heavily rely on fixed automation. The key advantage of fixed automation is its efficiency and speed in producing large quantities, although it lacks flexibility. Once set up, changing the production process can be costly and time-consuming.

Programmable Automation

Programmable automation offers a middle ground between fixed and flexible automation, allowing for batch production. This type of automation is designed to accommodate different product configurations by reprogramming the equipment. For instance, CNC (Computer Numerical Control) machines in manufacturing can be reprogrammed to create different parts or products by altering the software instructions. Similarly, batch processing in chemical plants can be adjusted to produce various chemicals by modifying the processing parameters. Programmable automation is highly beneficial for industries that produce in smaller volumes but need the ability to switch between different products or batches quickly.

Flexible Automation

Flexible automation, also known as soft automation, is the most adaptable type of automation. It can manage a wide variety of products without significant reprogramming or downtime, making it ideal for environments where product designs change frequently. This type of automation is often seen in flexible manufacturing systems (FMS) and

robotics in manufacturing, where robots can perform multiple tasks and adapt to different product lines. Flexible automation is advantageous in industries such as electronics or consumer goods manufacturing, where product cycles are short and customization is key. Although it offers significant flexibility, the initial investment in flexible automation systems can be high due to the advanced technology required.

Industrial Automation

Industrial automation encompasses the use of control systems like computers, Programmable Logic Controllers (PLCs), and robots to manage different processes and machinery in various industries. This type of automation is crucial in sectors like automotive, aerospace, food and beverage, and pharmaceuticals, where precision, reliability, and efficiency are paramount. Industrial robots, for example, are used to perform tasks such as welding, painting, assembly, and material handling. The integration of sensors, actuators, and control software enables these systems to operate autonomously, reducing the need for human intervention and minimizing errors.

Office Automation

Office automation refers to the use of computers, software, and other electronic devices to perform and manage office tasks that were traditionally done manually. This includes tasks such as word processing, email management, digital scheduling, data entry, and document management. Office automation systems streamline administrative processes, improve communication, and enhance productivity. For instance, word processing software enables the creation, editing, and formatting of documents with ease, while email systems facilitate instant communication across the globe. Additionally, digital scheduling tools help in organizing meetings and appointments efficiently, reducing the likelihood of conflicts or missed deadlines.

Home Automation

Home automation involves the control of home appliances and systems using the internet and smart devices, creating what is commonly referred to as a "smart home." Through the integration of various technologies, homeowners can remotely monitor and control their lighting, heating, security systems, and entertainment devices. Examples include smart thermostats that learn the user's preferences and adjust temperatures accordingly, automated lighting systems that

can be controlled via smartphone apps, and security cameras that provide real-time surveillance footage. Home automation not only offers convenience but also contributes to energy savings and enhanced home security.

IT Process Automation (ITPA)

IT process automation (ITPA) is a specialized form of automation that focuses on the automation of IT processes and workflows. It involves the use of software tools to automate repetitive tasks such as software deployment, system backups, network management, and incident response. By automating these processes, IT departments can reduce manual intervention, minimize errors, and improve response times. For example, automated software deployment tools can ensure that updates are rolled out consistently across an organization, while network management automation can help in monitoring and maintaining network health without constant human supervision. ITPA plays a critical role in maintaining the efficiency and reliability of IT infrastructure in organizations.

(*Adapted from*: https://www.conger.com/types-of-automation/)

1. What type of automation is suitable for high-volume production?
2. Give an example of programmable automation.
3. What is the main benefit of flexible automation?
4. What devices are used in industrial automation?
5. How does office automation help in managing tasks?
6. What is an example of home automation?
7. What does IT process automation (ITPA) manage?

Task 4. Read the statements and say true or false.
1. Fixed automation is suitable for small production batches.
2. Programmable automation can be reconfigured to handle different tasks.
3. Flexible automation requires significant reprogramming for different products.
4. Industrial automation uses manual processes to control machinery.
5. Office automation involves using computers for scheduling and word processing.
6. Home automation cannot control lighting systems.
7. IT process automation helps in managing computer networks.

Task 5. Fill in the gaps with the correct option.
The Latest Automation Technologies

Automation technologies are constantly _____ (1) to make our lives easier and more efficient. One of the most popular forms of automation is the use of _____ (2) in manufacturing. These robots can perform tasks that are dangerous or repetitive, allowing humans to focus on more complex jobs. Another exciting development is in the field of _____ (3) intelligence (AI). AI can analyze data much faster than humans and can learn from its experiences. This technology is being used in many areas, from healthcare to _____ (4) service.

Self-driving cars are another _____ (5) advancement in automation technology. These vehicles use a combination of sensors, cameras, and AI to _____ (6) themselves on roads. Additionally, drones are becoming more common for _____ (7) deliveries and aerial photography.

Finally, _____ (8) home devices like thermostats and security cameras are becoming increasingly popular. These devices can be controlled remotely and can learn your habits to save energy and improve security.

advancing	reducing	increasing	declining
computers	humans	robots	sensors
mechanical financial	artificial	physical	emotional
medical	historical	recent	traditional
drive	wash	build	repair
underwater	food	space	male
large	mobile	smart	traditional

Task 6. Match the sentence halves.

1. Fixed automation is ...	a. ... In industries where products change frequently.
2. Programmable automation is ...	b. ... Highly efficient but less adaptable to new products.
3. Flexible automation allows ...	c. ... Be used to reduce labor costs.
4. In manufacturing, automation can ...	d. ... To perform repetitive tasks.

5. Automated systems are often used ...

6. Industrial robots are a key part of ...

e. ... Automated production lines.

f. ... The production process to adapt quickly.

Task 7.

1. Describe two types of automation: Describe one type of automation used in manufacturing and another used in daily life. For example, compare industrial automation (e.g., robotic arms on an assembly line) and home automation (e.g., smart thermostats).

Questions to consider: What tasks do they perform? How do they benefit people? Are there any drawbacks?

2. Discuss the differences: Compare fixed and flexible automation. Discuss how each is used and in which industries they might be most beneficial.

Questions to consider: What is the main difference between them? Can you give an example of each?

LISTENING

Task 8. Listen the audio script and do the next tasks https://www.bbc.co.uk/learningenglish/english/features/6-minute-english/ep-151015

1. Read the following statements and decide if they are true (T) or false (F) based on the dialogue.

1. Neil and Finn discuss robots and automation in real life, not just in science fiction.

2. According to Finn, robots in Star Wars speak in a way similar to humans.

3. Automation refers to the use of machines to perform tasks traditionally done by humans.

4. Neil correctly guessed that jobs involving social and emotional skills are most likely to be automated.

5. Michael Osborne mentions that only manual labor is under threat from automation.

6. The term "cognitive labour" refers to tasks that require physical strength.

7. Some white-collar jobs, such as reviewing contracts, can be done faster and more accurately by artificial intelligence.

8. Matthew Whalley believes that automation will completely replace lawyers.

9. Neil and Finn believe that robots could soon replace radio presenters.

10. "Keeping your fingers crossed" means hoping for a positive outcome.

2. Choose the correct option to complete the sentences.

1. Automation refers to ___.
    a) the use of machines to do work that people do or used to do
    b) the ability to manipulate small objects
    c) the process of manual dexterity

2. A person is ___ to a disease if they are likely to be affected by it.
    a) resistant   *b) immune*   *c) susceptible*

3. Manual dexterity means being good with your ___.
    a) hands   *b) head*   *c) feet*

4. Cognitive labour involves using your ___.
    a) physical strength   *b) hands*   *c) mind*

5. The term "noggin" informally refers to the ___.
    a) heart   *b) head*   *c) feet*

6. A ___ job is typically done in an office rather than a factory.
    a) blue collar   *b) white collar*
    c) green collar

7. Artificial intelligence (AI) is the ability of a computer to ___ .
    a) perform manual tasks
    b) copy intelligent human behaviour
    c) work without electricity

8. "Keeping your fingers crossed" means ___ .
    a) hoping that things will turn out the way you want them to
    b) making a promise
    c) preparing for the worst

Task 9. Match the beginning of each sentence (left column) with the correct ending (right column).

1. Fixed automation is best suited for	a. using the internet and smart devices.
2. Programmable automation allows for	b. IT tasks and workflows.

3. Flexible automation can handle a variety of products

4. Industrial automation uses control systems

5. Office automation involves the use of

6. Home automation allows for the control of home appliances

7. IT process automation automates

8. Flexible manufacturing systems are an example of

c. high-volume production with little variation.

d. batch production with reprogrammable equipment.

e. without significant reprogramming.

f. flexible automation in a production environment.

g. like computers and robots in industries.

h. computers and software for office tasks.

WRITING

Task 10.

1. Write an email to your teacher explaining what you learned about different types of automation and how they are used in everyday life.

2. Write a short opinion piece discussing whether automation is good or bad for society.

Unit 3. Control systems: types of control systems

VOCABULARY

Task 1. Match each term with its correct definition.

1. open-loop control system

2. closed-loop control system

3. feedback

4. regulator

5. actuator

6. detector

a. the result or effect of the control system's process.

b. a device that performs the necessary action as decided by the regulator.

c. the information returned to the control system about the output to make adjustments.

d. the method or series of actions performed by a control system

e. external factors that affect the performance of a control system.

f. the component that compares the output

with the setpoint and makes decisions.

7. input	g. a control system that does not use feedback to adjust its operation
8. output	h. the information or command given to a control system.
9. setpoint	i. a control system that uses feedback to adjust its operation.
10. disturbance	j. the desired value that a control system aims to achieve.
11.process	k. the transmission of information within a control system.
12. signal	l. a device that measures physical quantities like temperature or pressure
13. SISO	m. A control system works with discrete input signals at specific intervals
14. discrete	n. control systems are simpler to design but may not always be accurate.
15. linear	o. a control system has multiple inputs and multiple outputs.
16. MIMO	p. a control system' s behaviour does not change over time
17. nonlinear	q. a control system has a single input and a single output.
18.time-invariant	r. a control system' s behaviour changes over time.
19. time-varying	s. a control system operates in real-time with a continuous input signal.
20. continuous	t. a control system has a proportional relationship between input and output.

WRITING

Task 2. Match each sentence with the correct vocabulary word.

Detector, regulator, setpoint, disturbance, actuator, output, signal, open-loop, process, feedback, closed-loop, input.

1. The _____ measures the room temperature and sends the information to the regulator.

2. The _____ adjusts the heating system based on the feedback it receives.

3. The _____ in this system is to maintain the temperature at 22

degrees Celsius.

4. A sudden change in weather can be a _____ that affects the performance of the system.

5. The _____ converts the regulator' s command into physical action.

6. The _____ control system uses feedback to maintain the desired setpoint.

7. The _____ control system follows a fixed program without adjusting for errors.

8. The _____ provided by the detector helps the regulator make accurate decisions.

9. The _____ of the control system includes heating the room to the setpoint temperature.

10. The _____ is the information given to the system to start the process.

11. The _____ of the control system is the comfortable temperature maintained in the room.

12. The _____ within the control system ensures all parts communicate effectively.

READING

Task 3. Read the text and answer the questions according to the text.

Control System Types

There are several different types of control systems, including:

Open-loop control systems: These systems do not use feedback, which means that the output is not influenced by the actual performance of the system. Instead, the input to the system is predetermined based on a set of predetermined rules or instructions. This can make open-loop control systems less precise and less responsive to changes in the system or the environment.

Closed-loop control systems: These systems use feedback to compare the desired output of the system to the actual output, and adjust the input to the system based on the difference between these two signals (called the error). The goal of a closed-loop control system is to reduce or eliminate the error by adjusting the input to the system in a way that drives the output towards the desired value. This can make closed-loop control systems more precise and more responsive

to changes in the system or the environment.

Continuous control systems: These systems operate over a continuous range of time and/or output values. They may use analog or digital signals to represent the input and output of the system. Continuous control systems are often used in applications where a continuous output is required (such as in a temperature control system).

Discrete control systems: These systems operate at discrete points in time, and the input and output are typically represented by digital signals. Discrete control systems are often used in applications where the output is only required at specific points in time (such as in a machine control system).

Linear control systems: These systems can be represented by linear differential equations, which means that the system dynamics are proportional to the input and can be described using linear mathematical operations. Linear control systems have certain properties (such as superposition) that make them relatively easy to analyse and control.

Nonlinear control systems: These systems cannot be represented by linear differential equations, and may exhibit complex behaviours such as bifurcations and chaos. Nonlinear control systems can be more challenging to analyse and control than linear systems and may require specialized techniques or algorithms.

Time-invariant control systems: These systems have the same input-output relationship at all times, which means that the system dynamics do not change over time. Time-invariant systems are often used in applications where the system parameters are not expected to vary significantly over time.

Time-varying control systems: These systems have a time-varying input-output relationship, which may be caused by changes in the system dynamics or external factors. Time-varying systems can be more challenging to analyse and control than time-invariant systems, as the system dynamics may change over time.

Single-input single-output (SISO) control systems: These systems have a single input and a single output, which means that there is only one degree of freedom in the system. SISO systems are relatively simple to analyse and control and are often used in basic control systems.

Multiple-input multiple-output (MIMO) control systems: These

systems have multiple inputs and multiple outputs, and may be more complex to analyse and control than SISO systems. MIMO systems can be used to control systems with multiple degrees of freedom or to achieve more advanced control objectives.

(*Taken from*: https://www.electronicsforu.com/technology-trends/learn-electronics/control-system-definition-types-applications-and-faqs)

1. Compare their key characteristics and give examples of each.

2. Explain the role of feedback in closed-loop control systems. How does feedback contribute to improving system performance?

3. Describe the differences between continuous and discrete control systems. Provide examples of applications where each type is commonly used.

4. What are the main advantages of linear control systems? How do they differ from nonlinear control systems in terms of behaviour and complexity?

5. Discuss the importance of system dynamics in time-invariant and time-varying control systems. Provide examples of scenarios where each type of system would be preferable.

6. Compare single-input single-output (SISO) and multiple-input multiple-output (MIMO) control systems. What are the advantages of using a MIMO system over a SISO system in complex control applications?

Task 4. Say true or false.

1. Open-loop control systems use feedback to adjust their output based on system performance.

2. Closed-loop control systems rely on predetermined rules or instructions for operation.

3. Continuous control systems operate at discrete points in time using digital signals.

4. Nonlinear control systems can be described using linear differential equations.

5. Time-invariant control systems have the same input-output relationship over time.

Task 5. Choose the right options.

1. An open-loop control system __ feedback.
   a) uses   *b) does not use*

2. Continuous control systems operate __ over time.
   a) continuously   *b) discretely*

3. Linear control systems can be described using __ differential equations.
   a) linear   *b) nonlinear*
4. Time-invariant systems have __ system dynamics over time.
   a) constant   *b) varying*
5. A single-input single-output (SISO) system has __ input(s) and __ output(s).
   a) one, one   *b) multiple, multiple*

WRITING

Task 6. Fill in the gaps with the correct option.
   1. An open-loop control system does not use _____ (feedback / actuator / setpoint) to regulate its output.
   2. A _____ (linear / nonlinear / discrete) control system is one where the output is directly proportional to the input.
   3. In a closed-loop control system, the _____ (output / input / disturbance) is compared with the desired setpoint to generate an error signal.
   4. A continuous control system operates with _____ (time-varying / time-invariant / continuous) signals that change smoothly over time.
   5. A _____ (SISO / MIMO / detector) system has multiple inputs and multiple outputs.
   6. The _____ (feedback / actuator / detector) measures the process variable and sends this information to the controller.
   7. A time-invariant control system has characteristics that _____ (change / do not change / vary) over time.
   8. The _____ (output / setpoint / disturbance) is the desired value that the control system aims to achieve.
   9. An _____ (input / output / actuator) is a device that converts the controller' s signal into action on the process.
   10. A _____ (regulator / disturbance / signal) is any external factor that can affect the performance of the control system.

Task 7. Correct the mistakes in the following sentences.

1. A open-loop control system uses feedback to adjust its output.

2. Closed-loop control systems are less accurate than open-loop control systems.

3. A discrete control system operates continuously without any interruptions.

4. Linear control systems have complex, non-proportional relationships between input and output.

5. In a MIMO control system, there is only one input and one output.

Task 8. Listen the audio script and do the next tasks.
Introduction to Control Systems
https://www.youtube.com/watch?v=HcLYoCmWOjI&list=PLBlnK6
fEyqRjQIKIbGFAopRhZ1mNSv0pM
1. Answer the questions

1. What is a control system? Can you name a simple example?

2. Describe an example of a control system used in everyday life. How does it work?

3. What is a block diagram in the context of control systems? Why is it useful?

4. What are some benefits of using control systems in various industries?

5. Who is the target audience for the control systems course discussed in the video?

2. Describe a Control System:

1.Choose a control system you are familiar with and describe its components and operation.

2. In pairs, discuss the advantages of control systems in modern technology. Present your findings to the class.

Task 9.

1. Explain the difference between open-loop and closed-loop control system.

Describe how each system operates and give an example for both.

2. Discuss the advantages and disadvantages of using closed-loop

control systems.

What are the benefits of feedback in a closed-loop system? Are there any drawbacks?

Task 10. Write a short paragraph (5-7 sentences) explaining the difference between open-loop and closed-loop control systems. Use at least three of the following words: feedback, setpoint, output, adjust, monitor.

Unit 4. Robotics: types of robots (industrial, service, collaborative)

VOCABULARY

Task 1. Match each term with its correct definition.

1. medical robot	a. artificial devices that replace missing body parts.
2. Prosthetics	b. the ability to adapt to new, different, or changing requirements
3. Flexibility	c. the process of combining different systems or components to work together.
4. Integration	d. capable of operating without direct human control.
5. Autonomous	e. a piece of work to be done or undertaken

6. Human-Machine Interaction	f. a robot that performs tasks for humans, often in non-industrial environments.
7. Task	g. a robot designed to work alongside humans in a shared workspace.
8. Industrial Robot	h. capable of operating without direct human control.
9. Service Robot	i. devices that detect and respond to changes in the environment
10. Automation	j. the process of producing goods using machinery
11. Manufacturing	k. a robot used in manufacturing processes
12. Assembly Line	l. a production process that breaks down a complex job into a series of smaller tasks.
13. Precision	n. the process of keeping equipment in good working condition
14. Efficiency	o. the quality of being exact and accurate.
15.Safety	p. the ability to accomplish a task with the least waste of time and resources
16. Welding	q. the condition of being protected from danger or harm
17. Maintenance	r. the process of joining two materials, usually metals, by melting and fusing them.
18. Programming	s. the process of creating a set of instructions for a computer or robot to follow.
19. Sensors	t. a robot used in the healthcare industry to assist with surgeries, rehabilitation, or patient care.
20. Collaborative Robot (Cobot)	u. the study and design of systems that allow humans and machines to communicate effectively.

WRITING

Task 2. Fill in the gaps.

Flexibility, prosthetics, autonomous, collaborative robots, sensors, safety, precision, industrial robots, tasks, welding, efficiency, maintenance, service robots, tasks, medical robots, precision, programming, industrial robots, durability, sensors, collaborative

robots (cobots).

1. _____ robots often have advanced _____ to detect obstacles and ensure _____ while working alongside humans.

2. The _____ of industrial robots allows them to perform _____ tasks like welding and painting with high _____ .

3. _____ is essential for ensuring that robots remain functional and efficient over time.

4. Service robots can be found in households, hospitals, and public spaces, performing a variety of _____ to improve quality of life.

5. The development of _____ technology has led to the creation of _____- devices that help people with disabilities.

6. _____ robots are designed to assist in medical procedures, improving precision and patient outcomes.

7. _____ involves creating software that allows robots to perform specific tasks.

8. Industrial robots often have high _____ to ensure they can perform tasks accurately.

9. _____ sensors are crucial for collaborative robots to safely interact with humans.

10. The _____ of robots allows them to be used in various environments and applications.

READING

Task 3. Read the text and say true or false.
Types of Robots

Robots are becoming an integral part of modern industries and everyday life. There are three main types of robots: industrial robots, service robots, and collaborative robots, also known as cobots.

Industrial Robots are primarily used in manufacturing environments. They are designed to perform repetitive tasks with high precision and efficiency. These robots can work on assembly lines, handle materials, and even carry out tasks such as welding and painting. By automating these processes, companies can increase production rates and reduce human error.

Service Robots perform tasks for humans, often outside of industrial settings. These robots can be found in households, hospitals, and even in public spaces. Examples include robotic vacuum cleaners, lawn mowers, and medical robots that assist doctors during surgeries.

Service robots are designed to improve the quality of life by taking over mundane or hazardous tasks.

Collaborative Robots (Cobots) are designed to work alongside humans in a shared workspace. Unlike traditional industrial robots, cobots are equipped with advanced sensors and safety features that allow them to interact safely with their human coworkers. They can assist with tasks that require a human touch, such as assembling delicate components or providing support in manufacturing processes.

As technology continues to advance, the role of robots in various sectors is expected to grow, making tasks more efficient, precise, and safe.

(*Adapted from*: Types of robots and how they are used https://builtin.com/articles/types-of-robots)

1. Industrial robots are commonly used in household chores.
2. Service robots can be found in hospitals.
3. Cobots are designed to work alone without any human interaction.
4. Industrial robots help increase production rates and reduce human error.

Task 4. Answer the questions based on the text.
1. What are the three main types of robots mentioned in the text?
2. How do industrial robots help in manufacturing?
3. Give an example of a service robot and its function.
4. What makes collaborative robots different from traditional industrial robots?

Task 5. Choose the correct answer.
1. What is the primary use of industrial robots?
    a. Assisting doctors during surgeries
    b. Performing household chores
    c. Manufacturing processes
    d. Working in public spaces
2. Which type of robot is designed to work alongside humans?
    a. Industrial Robot
    b. Service Robot
    c. Collaborative Robot (Cobot)
    d. Autonomous Robot
3. Which feature is crucial for collaborative robots to ensure

safety?

      a. High speed   *b. Advanced sensors*

      c. Strong materials   *d. Large size*

  4. What task might a service robot perform in a hospital?

      a. Welding metals   *b. Vacuuming floors*

      c. Assisting in surgeries   *d. Painting walls*

  5. What is a common feature of industrial robots?

      a. Ability to work without any human intervention

      b. Designed to improve the quality of life

      c. Equipped with safety features for human interaction

      d. High precision and efficiency in repetitive tasks

WRITING

Task 6. Match the beginning of each sentence (left column) with its correct ending (right column).

1. Autonomous robots are widely used in ...	a. ... the automation of complex tasks.
2. Programming is essential for ...	b. ... assembly lines to operate smoothly and safely.
3. Regular maintenance ensures that ...	c. ... errors and defects in the final products.
4. Sensors detect changes in ...	d. ... manufacturing environments to monitor conditions.
5. Modern manufacturing relies on ...	e. ... manufacturing processes to run continuously.
6. Safety protocols are crucial in ...	f. ... various manufacturing processes.
7. Automation increases the efficiency of ...	g. ... automated systems to adapt to different tasks.
8. The assembly line was enhanced by ...	h. ... the implementation of new automation technology.
9. Precision in automation helps to reduce ...	i. ... equipment works at optimal performance.
10. Flexibility in automation allows for ...	j. ... high levels of efficiency and productivity.

SPEAKING

Task 7. Answer the following questions in 1-2 sentences.

1. How do industrial robots contribute to the manufacturing process?

2. What is one example of a task that a service robot might perform in a household?

3. Describe a scenario where a collaborative robot would be beneficial.

4. What are some key features that make collaborative robots safe to work alongside humans?

5. Why is regular maintenance important for industrial robots?

Task 8. Reorder the words to form correct sentences.

1. robots / are / used / Industrial / factories / in

2. safely / humans / alongside / Cobots / can / work

3. is / crucial / Maintenance / robots / for / effective / operation / the / of

4. sensors / advanced / equipped / Service / are / robots / with

5. process / Manufacturing / involves / production / goods / of / the

LISTENING

Task 9.

1. https://learnenglishteens.britishcouncil.org/skills/reading/c1-reading/robots-friend-or-foe

2. Listen the information about robots and answer the following questions https://www.youtube.com/watch?v=KQG_i4VPC6k

What is a robot?

Give two examples of tasks that robots can do with precision.

What does it mean if a robot is autonomous?

Why might robots be used in warehouses?

What is one educational use of robots mentioned in the video?

How do robots help in dangerous situations?

What are some future capabilities of robots as described in the video?

How does the robot Aibo provide companionship?

What is meant by robots being diverse?

What benefits do humans gain from robots handling repetitive tasks?

Task 10.

1. Write a short essay (150-200 words) on the impact of robots on modern industry. Discuss the benefits and potential challenges of using robots in various sectors, such as manufacturing, healthcare, and service industries. Use at least five of the following words: automation, precision, safety, efficiency, sensors, collaborative, industrial, service, maintenance, programming.

2. Write a short paragraph (5-7 sentences) about the benefits of using robots in manufacturing. Use at least three of the following words: efficiency, precision, safety, automation, maintenance, flexibility.

Task 11. Read an article about robot teachers, do the tasks below. https://learnenglish.britishcouncil.org/sites/podcasts/files/LearnEnglish-Reading-B1-Robot-teachers.pdf

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Unit 5. Introduction to CAD/CAM software.

VOCABULARY

Task 1. Match the terms with their definitions.

CAD (Computer-Aided Design): Software used for creating precise drawings, models, and technical illustrations of physical objects. It allows designers to visualize, modify, and optimize a design before it is manufactured.

CAM (Computer-Aided Manufacturing): Software that uses CAD models to generate toolpaths and instructions for automated machines, guiding them to manufacture the designed parts accurately.

1. Programmable Logic Controller (PLC)	a. a user interface that connects operators to the controller for monitoring and control.
2. HMI (Human-Machine Interface)	b. a digital computer used for automation of industrial processes.
3. Algorithm	c. the process of adjusting and setting equipment to ensure accurate measurements.
4. Calibration	d. a set of rules or calculations used to solve problems and perform tasks in

control systems.

5. Real-time System   e. the ability of a system to continue operating properly in the event of a failure.

6. Batch Process   f. a system that processes data and provides outputs almost instantaneously.

7. Continuous Process   g. the methods and systems used to control the conditions within a process to achieve a desired result.

8. Redundancy   h. a control method that adjusts the output proportionally to the error.

9. Fault Tolerance   i. the inclusion of extra components or systems to increase reliability and ensure operation if one part fails.

10. Process Control   j. tht process that runs continuously without interruptions.

11. Distributed Control System (DCS)   k. a system designed to prevent or mitigate hazardous events in industrial processes.

12. Network Protocol   l. the behavior of a system when subjected to a sudden change or step input.

13. Safety Instrumented System (SIS)   m. ethernet networks used in industrial environments for control, monitoring, and data collection.

14. Industrial Ethernet   n. the delay between the application of a control action and its effect on the process variable.

15. Proportional Control   o. a control method that adjusts the output based on the rate of change of the error.

16. Integral Control   p. a set of rules and conventions for communication between network devices.

17. Derivative Control   q. a process that produces products in groups or batches.

18. Loop Tuning   r. the process of adjusting control parameters to achieve optimal system performance.

19. Dead Time   s. a control method that adjusts the output based on the accumulation of past errors.

20. Step Response   t. a control system where control elements are distributed throughout the system rather than centralized.

Task 2. Read the text and answer the questions.

Automated control of technological processes

Automated control systems are crucial in modern industries to ensure efficient and reliable operations. These systems use various components to manage and regulate technological processes with minimal human intervention. One of the key elements in automated control is the feedback loop, which helps achieve the desired outcomes by continuously feeding back the output into the system as input. This allows the system to make adjustments and maintain the setpoint, which is the target value for a process variable.

Programmable Logic Controllers (PLCs) and Human-Machine Interfaces (HMIs) are commonly used in automated control systems. PLCs are digital computers used for automation, while HMIs provide a user interface for operators to monitor and control processes.

There are different types of control systems, such as continuous control and discrete control. Continuous control systems monitor and adjust process variables continuously, while discrete control systems operate at specific intervals or in response to certain events. For example, a PID controller is a common type of feedback controller used in many industrial applications to maintain precise control over process variables.

In addition to these components, SCADA systems play a vital role in automation by providing remote monitoring and control capabilities. They allow operators to oversee and manage complex processes from a central location, ensuring that everything runs smoothly.

Overall, automated control systems improve efficiency, reduce human error, and enhance the reliability of technological processes, making them indispensable in various industries.

(*Taken from*: https://mdiod.com/en/automated-control-systems-for-technological-processes-asc/)

1. What is the main function of automated control systems?

2. How do feedback loops contribute to automated control?

3. What is the role of PLCs and HMIs in automated control systems?

4. What is the difference between continuous control and discrete control systems?

5. What role do SCADA systems play in automation?

Task 3. Fill in the gaps.

Technological, HMIs, PLCs, SCADA, feedback loop, setpoint, continuous control.

1. Automated control systems use various components to manage and regulate _____ processes.

2. A _____ helps achieve the desired outcomes by continuously feeding back the output into the system as input.

3. The _____ is the target value for a process variable.

4. A _____ system monitors and adjusts process variables continuously.

5. _____ systems provide remote monitoring and control capabilities.

6. _____ are digital computers used for automation.

7. _____ provide a user interface for operators to monitor and control processes.

Task 4. Choose the right option.

1. What is a system where outputs are fed back into the system as inputs to achieve desired results?

    a) SCADA system   *b) Feedback loop*
    c) Disturbance   *d) Regulator*

2. What is a common type of feedback controller used in industrial applications?

    a) SCADA system   *b) PID controller*
    c) Continuous control   *d) Discrete control*

3. What allows operators to manage complex processes from a central location?

    a) Process variable   *b) Regulator*
    c) SCADA system   *d) Disturbance*

4. What are digital computers used for automation?

    a) HMI   *b) PLC*
    c) PID controller   *d) SCADA system*

5. What provides a user interface for operators to monitor and control processes?

    a) PID controller   *b) PLC*
    c) HMI   *d) Feedback loop*

Task 5. Discuss with a partner the advantages and potential challenges of using automated control systems in technological processes. Use at least three vocabulary terms from the list provided.

Task 6. Complete the sentences.

PLC, HMI, algorithm, calibration, real-time, batch, redundancy, proportional, integral, derivative

1. A _____ is a digital computer used for automation of industrial processes.

2. The _____ is a user interface that connects operators to the controller for monitoring and control.

3. An _____ is a set of rules or calculations used to solve problems and perform tasks in control systems.

4. _____ is the process of adjusting and setting equipment to ensure accurate measurements.

5. A _____ system processes data and provides outputs almost instantaneously.

6. A _____ process produces products in groups or batches.

7. _____ is the inclusion of extra components or systems to increase reliability and ensure operation if one part fails.

8. _____ control adjusts the output proportionally to the error.

9. _____ control adjusts the output based on the accumulation of past errors.

10. _____ control adjusts the output based on the rate of change of the error.

Task 7. Decide if the following statements are true or false. Correct the false statements.

1. An HMI provides a user interface for operators to monitor and control processes.

2. A PLC is a device that converts the controller' s signals into physical action.

3. Feedback loops are unnecessary in automated control systems.

4. SCADA systems allow operators to manage complex processes from a central location.

5. A PID controller uses proportional, integral, and derivative controls.

Task 8. Fill in the gaps in the following text using appropriate vocabulary words.

Feedback loop, setpoint, SCADA, redundancy, PID.

Automated control systems are vital in industries to ensure efficient operations. One crucial component is the _____ , which helps maintain the _____ , or target value for a process variable. In many industrial applications, a _____ controller is used to maintain precise control over these variables. Additionally, _____ systems provide remote monitoring and control, allowing operators to oversee complex processes from a central location. To ensure reliability, _____ is often implemented, adding extra components to prevent failures.

LISTENING

Task 9. Listen to the audio script and do the next tasks. Computer-Aided Design https://www.youtube.com/watch?v=JoGfw5BplCg
1. Answer the questions
   1. What is Computer-Aided Design (CAD)?
   2. Name three fields where CAD is used.
   3. Why is the ability to use CAD skills important in today' s economy?
   4. What are some benefits of studying CAD at St. Louis Community College?

2. Match the following terms with their definitions.

1. Drafting boards	a. The process of creating three-dimensional objects by layering material.
2. 3D printing	b. The creation and development of machinery and mechanical systems.
3. Additive manufacturing	c. Traditional tools used for drawing technical plans.
4. Mechanical design	d. A technology that creates objects by adding material layer by layer.

WRITING

Task 10. Write a short paragraph (5-6 sentences) explaining how CAD/CAM software benefits the manufacturing industry. Use at least five vocabulary words from the list.

Unit 6. Artificial Intelligence and machine learning in automation.
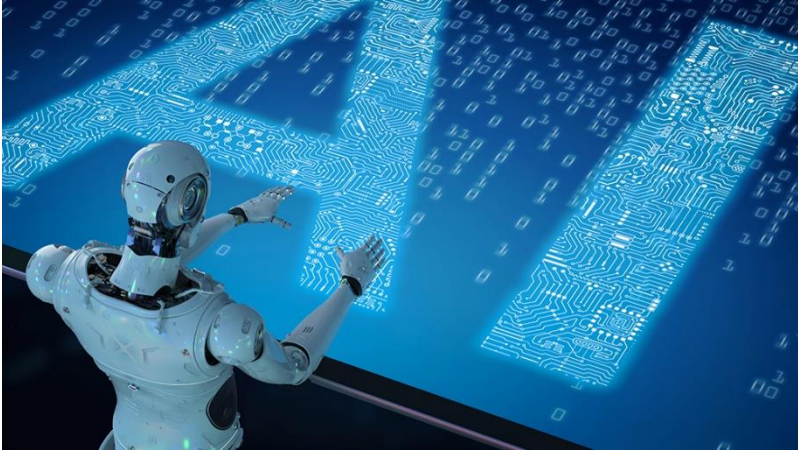
Task 1. Match the terms with their definitions.

1. Artificial Intelligence (AI)	A method of data analysis that automates analytical model building.
2. Machine Learning (ML)	Facts and statistics collected for analysis.
3. Algorithm	A type of machine learning where the model finds patterns without labeled data.
4. Data	The process of evaluating a model on a separate data set to ensure it generalizes well.
5. Predictive	A computational model based on the structure and functions of biological neural networks.
6. Neural Network	The process of transforming raw data into a set of features that can be used in machine learning.
7. Training	When a model learns the training data too well, including noise and outliers, and performs poorly on new data.
8. Supervised Learning	A parameter whose value is used to control the learning process.

9. Deep Learning	A subset of machine learning involving neural networks with many layers.
10. Natural Language Processing (NLP)	A branch of AI that helps computers understand, interpret, and respond to human language.
11. Data Mining	A type of predictive modeling technique that estimates the relationships among variables.
12. Feedback Loop	Extremely large data sets that can be analysed to reveal patterns and trends.
13. Cloud Computing	Programs designed to carry out a series of tasks without human intervention.
14. Optimization	A type of predictive modelling technique that estimates the relationships among variables.
15. Unsupervised Learning	The process of making a system as effective or functional as possible.
16. Regression	The delivery of computing services over the Internet
17. Validation	A system where the output is fed back into the system as input.
18. Automation Software	The process of discovering patterns and knowledge from large amounts of data.
19. Big Data	A type of machine learning where the model is trained on labeled data.
20. Artificial Neural Network	Relating to the ability to predict future outcomes.
21. Feature Extraction	The process of teaching a machine learning model by providing data.
22. Hyperparameter	A computer system modeled on the human brain and nervous system.
23. Regression	A step-by-step procedure for calculations.
24. Overfitting	The ability of a computer or robot to perform tasks that usually require human intelligence.

Task 2. Fill in the gaps with the correct word from the vocabulary list.

1. _____ involves using computers to analyse and predict outcomes.

2. An _____ is necessary to solve complex problems step by step.
3. In _____ learning, the model is given labeled data to learn from.
4. _____ networks are inspired by the human brain.
5. _____ can help in making processes more efficient by reducing the need for human intervention.

Task 3. Read the text and answer the questions.
<div align="center">

What's the Difference Between
Machine Learning and Automation?
</div>

Let's start with machine learning, a subset of AI.

"It's an evolution," said Andreas Roell, managing partner of Analytics Ventures, a consultancy that helps businesses adopt AI. "AI fits into the bucket of workload analysis or task analysis. Business intelligence also sits in that same bucket. It's taking data, then analysing it.

Machine learning is typically a later-stage development, where machines take in data on their own and then analyse it, Roell explained. The biggest difference is that "machine learning identifies data signals relevant for the future," he added.

Automation is frequently confused with AI. Like automation, AI is designed to streamline tasks and speed workflows. But the difference is that automation is fixed solely on repetitive, instructive tasks, and after it performs a job, it thinks no further.

There's a good chance you use automation without even realizing it – for example, by automating emails to customers, automating the way you generate invoices, or automatically logging a help-desk inquiry. Workplace automation saves time and allows workers to focus on higher-priority initiatives. It's a reliable, computerized workhorse, able to show up and get the job done.

Machine learning takes these tasks and layers them in an element of prediction. Whereas automation would continue to do exactly as you requested – say, send invoices on a specific day – machine learning predicts when the invoices should go out, who did or did not receive one, and when payments are on the verge of being late.

Is AI the same as automation?

No, AI and automation are not the same. Automation involves an entire category of technologies that provide activity or work without

human involvement. For example, say an old-style water wheel represents automation, translating the power of falling water into a repetitive nonhuman activity or mechanical work. There is nothing about the water wheel that involves artificial intelligence; it just keeps doing the same thing over and over.

We often associate automation with computers, but it's been around for ages.

"If you can take the resources that you have and come up with some sort of silver bullet and that turns them into radically better efficiency for what you're getting back, that is going to be evolutionary dynamite," zoologist Antone Martinho-Truswell told Gizmodo. "You're going to do fantastically well, as we have. Our nearest relatives are all endangered because of us."

AI, on the other hand, involves a machine exhibiting and practicing something similar to what we describe as human thinking – that is, the ability to interact in thousands of ways with the world around us without receiving any prior explicit coding or instructions. Think, for instance, of how AI digital assistants like Siri or Alexa can understand and respond to our questions and commands.

The rate at which companies adopt AI is continuing to grow. Companies that have adopted AI are finding extensive cost savings, according to the McKinsey report on the state of AI in 2021, which interviewed 1,800 business leaders from various industries worldwide. (*Adapted from*: https://www.businessnewsdaily.com/10352-machine-learning-vs-automation.html)

1. What is machine learning, according to Andreas Roell?
2. How does machine learning differ from automation?
3. What role does automation play in the workplace?
4. Can you give two examples of how automation is used in workplaces?
5. What does machine learning add to automated tasks?
6. How does AI differ from automation, based on the text?
7. Why is AI described as being similar to human thinking?
8. How do companies benefit from adopting AI, according to the McKinsey report?
9. What is an example of automation that does not involve AI?
10. How do AI digital assistants like Siri or Alexa demonstrate AI?

Task 4. Decide if the statements are true or false.

1. Machine learning and automation are the same.
2. Automation involves an entire category of technologies that work without human involvement.
3. Machine learning predicts future events by analysing data.
4. AI and automation both require human intervention to function.
5. The rate of AI adoption in companies is decreasing.

WRITING

Task 5. Complete the sentences with the correct word from the list.

Subset, consultancy, analyse, streamline, repetitive, invoice, prediction, efficiency, inquiry, interaction.

1. Machine learning is a _____ of AI.
2. A _____ can help businesses adopt AI.
3. Automation helps to _____ workflows.
4. Machine learning can make _____ about future trends.
5. An automated system can send an _____ to customers.
6. AI improves the _____ of business processes.
7. _____ tasks can be performed by automation.
8. AI digital assistants can have _____ with humans.
9. Companies often hire a _____ to improve their business intelligence. 10. Automation saves time and increases _____.

Task 6. Construct sentences using the following words.

1. AI / help / businesses / save / costs
2. Automation / perform / repetitive / tasks / efficiently
3. Machine learning / analyse / data / independently
4. AI / digital / assistants / interact / with / humans
5. Machine learning / future / data signals / identify
6. Automation / streamline / workflows / speed / tasks
7. AI / evolutionary / process / business / intelligence
8. Automation / technology / without / human / involvement
9. Automation / reduce / workload / employees
10. Machine learning / important / predictions / make

Task 7. Choose the right option.
1. What is AI?
   a) A type of data
   b) The ability of machines to perform tasks requiring human intelligence
   c) A step-by-step procedure
2. What is used to prevent equipment failures in manufacturing?
   a) Neural networks
   b) Predictive maintenance
   c) Unsupervised learning
3. What kind of learning uses labeled data?
   a) Supervised learning
   b) Unsupervised learning
   c) Both a and b

SPEAKING

Task 8.
1. Describe the difference between supervised and unsupervised learning.
2. Explain how AI can be used in predictive maintenance.

WRITING

Task 9. Fill in the Gaps.
   AI and ML are crucial in modern _____ . AI allows machines to perform _____ tasks, while ML enables machines to learn from _____ . Neural networks, which are part of ML, are inspired by the _____ brain. Predictive maintenance in manufacturing uses AI to predict and prevent _____ failures. Deep learning involves using _____ networks with many layers to analyse data in more complex ways. Natural Language Processing improves _____ between humans and machines, and the Internet of Things connects devices for data _____ . Feature extraction is important in preparing _____ for model training. Overfitting and underfitting are issues that need to be addressed to ensure models _____ well to new data.

1.	a. technology	b. society	c. business	d. science
2.	a. repetitive	b. complex	c. routine	d. varied
3.	a. experience	b. data	c. inputs	d. patterns

4.	a. human	b. animal	c. artificial	d. natural
5.	a. equipment	b. system	c. machine	d. process
6.	a. neural	b. complex	c. layered	d. artificial
7.	a. communication	b. understanding	c. interaction	d. connection
8.	a. transfer	b. sharing	c. collection	d. analysis
9.	a. datasets	b. models	c. algorithms	d. features
10.	a. generalize	b. adapt	c. apply	d. conform

Task 10. Write a short paragraph (5-7 sentences) about the benefits of AI in the workplace. Use examples from the text.

LISTENING

Task 11. Listen the audio script and do the next tasks.
B1 English Listening Practice: Artificial Intelligence
https://www.youtube.com/watch?v=11Csu1K_2iU
1. Answer the questions
　1. What is Artificial Intelligence (AI), and how is it described in the video?
　2. How does AI positively impact our lives, according to the video? Can you give examples?
　3. In what ways does AI automation raise concerns, especially regarding jobs?
　4. How does AI contribute to medical research, as mentioned in the video? Can you provide more examples?
　5. What challenges or disadvantages does the video mention regarding AI technology?
　6. According to the video, how can AI language translation tools break down language barriers?

Unit 7. Digital and Analog Automation Equipment

VOCABULARY

Sensor   Microcontroller
Actuator   Encoder
Controller   Decentralized Control
PLC (Programmable Logic   Centralized Control
　Controller)
HMI (Human-Machine   PID Controller

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Interface)

SCADA (Supervisory Control and Data Acquisition)	Sensor Interface
Relay	Signal Conditioning
Analog Signal	A/D Converter (Analog-to-Digital)
Digital Signal	D/A Converter (Digital-to-Analog)
Transducer	Filter
Servo Motor	Amplifier
Frequency Converter	Oscilloscope

Task 1. Match the following definitions with the correct term

a) A system for remote monitoring and control. 1. actuator

b) A device that detects changes in physical conditions. 2. sensor

c) A device that converts an analog signal into a digital one. 3. A/D Converter

d) A component responsible for moving or controlling a mechanism or system. 4. SCADA

e) A system where each component operates independently without central control. 5. Decentralized Control

f) A circuit or device that prepares a signal for the next stage of processing, often by filtering or amplifying it. 6. Oscilloscope

g) A device that provides visual representation and measurement of electrical signals. 7. Signal Conditioning

h) A device that adjusts the speed of an electric motor by altering the frequency of the power supply. 8. Relay

i) An electrically operated switch used in control systems to turn on or off different components. 9. Frequency Converter

Task 2. Complete the sentences with the correct word from the vocabulary list.

1. The _____ provides precise control of position or speed.
2. An _____ signal has discrete values, while an analog signal is

continuous.

3. The _____ interface connects operators to machines.

4. A _____ removes unwanted components from a signal.

5. The _____ in the control system adjusts the temperature to the desired setpoint.

6. An _____ signal can be represented as a smooth wave.

7. A _____ signal can only have discrete values like 0 and 1.

8. _____ devices are crucial for converting physical phenomena into electrical signals.

9. The _____ motor requires a controller for accurate positioning.

10. In a _____ control system, all decisions are made at a central location.

11. The _____ interface allows technicians to monitor and interact with the system.

12. A _____ filter is used to remove noise from an electrical signal.

13. The _____ motor is often used in robotics for precise movements.

14. A _____ can control the speed of an electric motor by adjusting the frequency.

READING

Task 3. Read the text and answer the questions.
Digital and Analog Automation Equipment

In modern automation systems, both digital and analog equipment are essential. Digital devices, like Programmable Logic Controllers (PLCs), control complex processes with high accuracy. These devices use digital signals, which are in the form of binary numbers, to perform tasks. An Analog-to-Digital Converter (ADC) changes analog signals into digital ones, allowing digital devices to read and process the information.

Analog equipment works with signals that change continuously. Sensors, for example, detect physical changes like temperature or pressure and turn them into electrical signals. An amplifier increases the strength of these signals, making them easier to read. Filters are often used to remove any unwanted noise from the signal, so only the useful information is processed.

Both digital and analog devices are often used together in

automation systems. A Human-Machine Interface (HMI) shows the system' s status on a screen, while a PID (Proportional-Integral-Derivative) controller manages variables like temperature or pressure. Servo motors provide precise control of movement, which is important in robotics. Finally, a frequency converter adjusts the speed of motors, helping to control machinery in factories.

(*Adapted from*: https://crossroadenergy.com/understanding-the-difference-between-analog-and-digital-signals/)

1. What are PLCs used for in automation systems?
2. What type of signals do digital devices work with?
3. What does an Analog-to-Digital Converter (ADC) do?
4. How do sensors work in automation systems?
5. What is the function of an amplifier in analog equipment?
6. Why are filters important in processing signals?
7. How does a Human-Machine Interface (HMI) help operators?
8. What does a PID controller adjust in automation systems?
9. In what applications are servo motors especially useful?
10. How does a frequency converter control machinery?

Task 4. Choose the correct answer.
1. What type of signals do digital devices use?
    a) Continuous signals   *b) Binary numbers*
    c) Physical quantities
2. What is the main function of a sensor?
    a) To display data
    b) To increase signal strength
    c) To detect physical changes
3. Which device is used to adjust motor speed?
    a) Sensor   *b) Frequency converter*
    c) ADC
4. What is the purpose of a filter in an automation system?
    a) To convert signals   *b) To remove unwanted noise*
    c) To increase signal strength
5. What type of controller is a PID controller?
    a) Digital controller   *b) Analog controller*
    c) Hybrid controller
6. What does an Analog-to-Digital Converter (ADC) do?
    a) Converts digital signals to analog
    b) Converts analog signals to digital

c) Controls the speed of motors

7. In what type of applications are servo motors particularly important?

a) Communication systems

b) Lighting systems

c) Robotics and automation

8. What does a Human-Machine Interface (HMI) typically display?

a) The system' s mechanical components

b) The system' s electrical wiring

c) The system' s operational status

9. Which device can be used to convert physical changes into electrical signals?

a) Amplifier   *b) Sensor*

c) Frequency converter

10. What is the main role of a PLC in automation systems?

a) To provide power   *b) To control processes*

c) To amplify signals

WRITING

Task 5. Fill in the gaps

Programmable Logic Controllers (PLCs), digital, analog-to-Digital Converter (ADC), sensors, amplifier, filter, Human-Machine Interface (HMI), PID (Proportional-Integral-Derivative), servo, frequency.

Digital and Analog Automation Equipment In modern automation systems, both digital and analog equipment play crucial roles. Digital devices, such as _____ (1), are essential for handling processes that require precise control. These devices work with _____ (2) signals, which are discrete and represented by binary numbers. A _____ (3) is used to convert these signals from analog to digital form, making it possible for digital systems to process the data. On the other hand, analog equipment is used in scenarios where signals vary continuously. For example, _____ (4) convert physical quantities like temperature, pressure, or sound into electrical signals. An _____ (5) increases the strength of these signals to make them suitable for further processing. In many systems, a _____ (6) is necessary to remove unwanted frequencies from the signal, ensuring that only the desired information is processed. Automation systems often integrate both

types of equipment. For instance, a _____ (7) interface might display the system status, while a _____ (8) controller adjusts variables like temperature or pressure. The use of _____ (9) motors allows for precise control of movement, which is particularly important in applications like robotics. Finally, a _____ (10) converter can adjust the frequency of the power supply, thereby controlling the speed of motors in industrial settings.

Task 6. Match the beginning of each sentence (left column) with the correct ending (right column).

1. A sensor can detect physical properties like temperature,

2. A microcontroller is a small computer

3. An actuator converts electrical signals

4. An HMI provides an

5. A PID controller is used to maintain

6. SCADA systems monitor and control

7. An encoder can measure position

8. An amplifier

a. can be used to increase the strength of a weak signal.

b. interface that connects humans with machines.

c. and converts them into electrical signals.

d. into physical motion, such as moving a valve.

e. a desired level in a control system using feedback.

f. and convert them into digital data.

g. that is embedded in a device to control functions.

h. and relay information to a central system.

Task 7. Fill in the gaps with the correct word.

1. A _____ (*sensor, microcontroller, relay*) detects physical changes and converts them into electrical signals.

2. A _____ (*PID controller, D/A converter, SCADA*) is used to convert analog signals into digital signals.

3. The _____ (*HMI, amplifier, actuator*) provides a user interface for humans to interact with machines.

4. A _____ (*controller, filter, transducer*) converts energy from one form to another, such as from electrical to mechanical.

5. A _____ (*PLC, centralized control, frequency converter*) is a

digital computer used for automation of industrial processes.

6. In _____ (*decentralized control, signal conditioning, D/A conversion*), control tasks are distributed among multiple controllers rather than being handled by a single central unit.

7. A _____ (*servo motor, SCADA, microcontroller*) is used to precisely control the position or speed of mechanical parts.

8. The _____ (*sensor interface, PID controller, encoder*) translates position information into an electrical signal.

SPEAKING

Task 8.

1. Imagine you are explaining the components of an automation system to a new employee. Describe the role of digital devices like PLCs and analog devices like sensors, and how they work together.

2. Prepare a short presentation about the advantages of using digital equipment in automation. Highlight key features such as precision, ease of data storage, and processing.

3. In a group discussion (or imagined conversation), talk about the potential future developments in automation equipment. Discuss the potential advancements in digital and analog technologies and how they could impact industrial processes.

4. Explain the following terms to someone who is unfamiliar with them: Analog-to-Digital Converter (ADC), Human-Machine Interface (HMI), PID controller, and servo motor. Provide simple definitions and examples of their use.

LISTENING

Task 9. Listen carefully to the information and complete the following tasks. https://www.youtube.com/watch?v=T5xG7RN90ts
1. Complete the sentences with the correct words from the box.

Analog, digital, measuring, data, limitations, forms.

1. Signals come in many different _____ .

2. These forms can depend on the _____ that' s being communicated.

3. The type of _____ devices being used, like sensors, also matters.

4. Analog signals have continuous values, while _____ signals have discrete values.

5. The _____ of the hardware can affect the type of signal used.

2. Choose the correct answer.

1. What is a characteristic of analog signals?
    a) They have discrete values
    b) They can have continuous values
    c) They are always represented by 0 and 1
    d) They do not require any hardware

2. Which of the following is true about digital signals?
    a) They can take on any value within a range
    b) They are always continuous
    c) They are represented by a series of 0s and 1s
    d) They do not depend on the data being communicated

3. What can influence the type of signal used?
    a) The color of the wire
    b) The data being communicated
    c) The shape of the device
    d) The time of day

WRITING

Task 10.

1. Write a short paragraph describing how an automation system uses both digital and analog equipment to control a manufacturing process. Include at least three specific devices and their functions.

2. Write a short essay comparing digital and analog signals in automation. Discuss their differences, advantages, and disadvantages.

3. Explain the process of how a sensor and an ADC work together to provide data to a digital system. Include the steps from detecting a physical change to processing the digital data.

4. Write about the importance of integrating both digital and analog equipment in modern automation systems. Discuss how this integration can improve efficiency and accuracy.

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