

1.1.Video #1 – Introduction to PLC

(https://www.youtube.com/watch?v=PbAGl_mv5XI&list=PPSV)

Watch the video and answer the following question:

1. What is a PLC

A PLC is a computer without keyboard and displays.

2. What is a relay?

A relay is a device that turn on and off.

3. What are the disadvantages of using relays?

The video states the following disadvantage:

More downtime

Fail more frequently.

Energy consuming and lots of heat.

Take lot of space

Complicated and time consuming.

4. What is the role of a backplane in PLC system?

A backplane the role to physically connect CPU with it different input/output modules.

5. Give two main calculation capability of a PLC.

The main calculation capability of PLC are: SPC (statistical process control) and PID

6. Do we have an agreement between manufacturers on how to program PLCs?

Till now, there no agreement between manufacturers on how to program a PLC.

1.1.1. Terminology

English	Translation	Explanation
PLC	Automate programmable industriel	Programmable logic controller
CPU	Unité central de traitement	Central processing unit.
Relays	relais	
DCS	DCS	Distributed Control System. A type of PLC PC that works by itself to control a certain part of a larger process (e.g. refinery).
Function Block Diagram (FBD)	Diagramme de blocs fonctionnels	A piece of code that can be reused. Each reuse creates a new instance
HMI	IHM : interface homme/machine	Human Machine Interface. Also known as a touch screen display.
Ladder Diagram (LD)	language de contact.	A graphical programming language that is processed with rungs, much like actual relay logic.
Structured Text (ST)		One of the IEC 61131-3 programming languages. A high-level language that uses IF-THEN-ELSE statements. Also, WHILE-DO.

1.2.Video #3 – Transfer function

https://www.youtube.com/watch?v=AvaZ_E-nFTk&list=PPSV

Explain with your own words the main idea of the video

1.3.Video #4 – Artificial neural network (ANN)

<https://www.youtube.com/watch?v=jmmW0F0biz0&list=PPSV>

Analyze the video and answer the following questions:

a. What are the components of an ANN?

b. Using your own words, explain what the linear regression is?

The Linear regression in ANN is the mathematical model that predict the future values

c. Which example has been given in this video to explain the processing in ANN?

In this video, the author has explained the ANN principle by giving the surfing decision example.

d. How to evaluate the accuracy of ANN?

The accuracy of an ANN is evaluated by estimating a cost function which describes the truncation error between the calculated value and the reference.

1.3.1. Terminology

Symbol	Verbal word	Explanation
\pm	plus-minus sign	
/	slash	Denotes division and is read as <i>divided by</i> or <i>over</i>
$\sqrt{}$	radical symbol	Denotes square root and is read as <i>the square root of</i> .
\neq	not-equal sign	
\approx	approximate equality.	
$<$	less-than	
$>$	greater-than	
\leq	less than or equal to	
\geq	greater than or equal to"	
\ll or \gg	"much less than" and "much greater than"	
\in	set membership	is read "is in", "belongs to", or "is a member of"
\notin	"is not in"	
$\frac{dy}{dx}$		If y is a variable that depends on x, then $\frac{dy}{dx}$, read as "d y over d x" (commonly shortened to "d y d x"), is the derivative of y with respect to x.

1.4.Audio #1 Technology

1.4.1. LISTENING GAP FILL

What _____ technology? Would we still be living in caves? Probably. I think there are two _____ technology. The kinds before and after computers. When we think about technology before computers, it _____. It was all mechanical. Things like steam trains and fridges. At the time, that _____ technology. But, today's technology is really cutting edge. It's the kind of technology that _____ soon as it hits the shelves. I love this. It's so exciting seeing it all happen. I love _____ technology we'll have in the future, and then buy _____. It's like buying technology from science fiction movies. I'd love to live to be 200 so I can see what technology _____

1.4.2. Writing expression

Write about technology for 10 minutes. Show your partner your paper.

1.5.Audio #2 science

1.5.1. Listening gap fill

Science is one of the most important subjects we study at school. I loved it. I _____ interesting. Time in my science lessons went very quickly because I _____ on things and doing experiments. I _____ sciences, physics, biology and chemistry. I wish I continued studying science. I would love to be a scientist now. I think being a computer scientist _____. Science is so important for our life and our world. All of the world's problems can be _____. We can go to different planets because of science. I hope governments pump lots of money into science so we have more and better scientists in the future. It's interesting to think _____ science will be like.

Write about science for 10 minutes. Show your partner your paper. Correct each other's work.

1.6.Audio #3 Organizing a group project

1.6.1. Listening A1: Organizing a group project

Listen to people organizing a group project and answer the questions to practice and improve your listening skills.

Before listening

Do the preparation task first. Then listen to the audio and do the exercises.

1.6.2. Preparation task

Match the times (a–f) with the words (1–6)

Words	Times
1. Three till five	a. 9.30
2. Four o'clock	b. 7.40
3. Before ten	c. 4.50
4. After ten	d. 10.15
5. Ten to five	e. 4.00
6. Twenty to eight	f. 3.00–5.00

Task 1- Are the sentences true or false?

Sentences	True	False
They want to start the project soon.		
The first meeting will be for two hours.		
Mornings before ten are good for everyone.		
Everyone is free at four.		
They're going to have the meeting in the library.		
Robert will leave before 5 p.m		

Task 2 -- Match the sentences (a–d) that mean the same thing (1–4).

Sentences

1. I can do 4.
2. I can't do 4.
3. I can always do 4.
4. We all agree to meet at 4.

Sentences

- a. I'm free every day at four.
- b. I'm free at four.
- c. I'm not free at four.
- d. We're going to meet at four.

Discussion - Where do you like to study with friends?

1.7.Audio#4 Robots: Back to the Future

1.7.1. Language Review

A. Collocations

Match words from each column to make collocations found in the article.

1. Flesh and	a. Changing	
2. To hold	b. Destroying	
3. To call to	c. Clip	
4. Soul-	d. Promise	
5. Game-	e. Error	
6. Rapid	f. Worlds	
7. Best of both	g. Blood	
8. Prone to	h. Mind	

B. Vocabulary Quiz

1. Which term best describes technology that creates new content, like text or images?
 - a. Automation
 - b. Robotics
 - c. Generative AI
 - d. Ubiquitous
2. A hybrid system that combines two advantages offers:
 - a. Rapid clip

- b. The best of both worlds
 - c. A game-changing approach
 - d. Work-life balance
3. Which of the following words describes tasks that are boring and repetitive?
- a. Transformative
 - b. Game-changing
 - c. Soul-destroying
 - d. Ubiquitous
4. Which of these is NOT a benefit of automation?
- a. Increased efficiency
 - b. Reduced errors
 - c. Enhanced creativity
 - d. Faster processes
5. Which term refers to a collaborative robot designed to work alongside humans?
- a. Bot
 - b. Cobot
 - c. Installation
 - d. Algorithm
6. Generative AI and large language models are transforming many industries. They are:
- a. Prone to error
 - b. Rapid clip
 - c. Game-changing
 - d. Flesh and blood
7. What does the term 'flesh and blood' imply when comparing humans to robots?
- a. Real and human
 - b. Ubiquitous
 - c. Pre-programmed
 - d. Prone to error
8. The development of large language models has been at a:
- a. Game-changing pace
 - b. Rapid clip
 - c. Prone to error
 - d. Work-life balance
9. Which of the following best describes a key benefit of work-life balance?
- a. Rapid clip
 - b. Soul-destroying tasks
 - c. Improved personal and professional life
 - d. To hold promise
10. The widespread use of smartphones and the internet can be described as:
- a. Ubiquitous
 - b. Prone to error
 - c. Soul-destroying
 - d. Well into the future

1.7.2. Robots: listen and fill the gaps

A long time ago, robots _____ fiction. Children loved looking at movies with robots. Today, robots are real, and _____. In the future, we will all have robots. They will vacuum the floor, wash the dishes, _____ our cars. I even think one day we'll have robot friends. In Japan today, _____ making robots to help old people and to _____. It's still early days. I'd say we are another 20 to 30 years away from robots _____ in our lives. What will happen to us when the world is full of robots? There'll be no jobs. McDonalds will be _____. Maybe one day we won't be able to tell robots and humans apart. Maybe _____ world.

1.8. Verbal translation Rules

ADD	SUBTRACT	MULTIPLY	DIVIDE
add	subtract	multiplied by	divide
sum	difference	of	quotient
more than	less than	product	divided equally
increased by	decreased by	times	per
exceeds	diminished by	double	ratio of
in all	minus	twice	split into
combined	fewer	triple	fraction
total	reduced by		
gain	take away		
plus	withdraw		
deposit			

1.8.1. Rules

- a. "Expressions" and "equations" refer to two different entities in mathematics. If you are dealing with an "equal sign", you are dealing with an "equation".

Unlike expressions, **algebraic equations** contain an **equal sign**.

An equation is a sentence where two algebraic expressions are equal.

To our list of "words" as shown in the chart at the top of this page, we can now add a sampling of words that imply the need of "an equal sign".

- b. Equal : is equivalent to : **is, are, was, were, equivalent to, same as, yields, gives**

- c. Continue to **look for commas**, to help you group your terms.

If you are having trouble determining what the equation might be, **make up a numerical problem** to see how the numbers in the problem are related to one another.

1.8.2. Example

Translate the following verbal problems into equations

	Verbal Statement	Algebraic Equation
1.	Three times a number, divided by ten equals fifteen.	$\frac{3n}{10} = 15$

2.	Ten less than the quotient of a number and two is zero.	$\frac{n}{2} - 10 = 0$
3.	Twelve more than the product of a number and two is thirty-six.	$2n + 12 = 36$
4.	Express the area of a rectangle whose length is twice its width decreased by 6. Numerical Example: If the width is 10, the length is 14, then the area, $A = 10 \cdot 14$. Just replace 10 with w for width, and 14 with $2w - 6$ for the length.	$A = \text{area}, w = \text{width}$ $A = w \cdot (2w - 6)$

In these examples, we will be using " n " to represent "*a number*". You can use any letter that you wish, such as x , a , b , etc.

	Verbal Statement	Algebraic Expression
1.	three more than a number	$3 + n$
2.	eight times a number, increased by 12	$8n + 12$
3.	seven less than four times a number	$4n - 7$
4.	five decreased by three times a number	$5 - 3n$
5.	the product of 10 and a number	$10n$
6.	a number divided by two	$n / 2$
7.	nine less than the twice the sum of a number and four	$2(n + 4) - 9$
8.	the quotient of fourteen and triple a number	$14/(3n)$
9.	5 times, a number increased by 6	$5(n + 6)$

Now, let's try reversing the situation: Given the algebraic expression, create a possible verbal statement.

10.	Given $3n - 2$, write a verbal expression that matches this mathematical expression.	Here are five possible answers: <ul style="list-style-type: none"> • three times a number decreased by two • triple a number minus two • two less than three times a number • three times a number diminished by two • the product of three and a number, reduced by two
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1.9. Translate each algebraic equation into words.

Equation or expression	Translation into words
$1/2x + 3 = 18$	Half of x added to three is equal to eighteen

$\frac{2}{3}(m+3)=6$	Two - thirds of the sum of m and three is equal to six
$3k+7=34$	Three times k plus seven is equal to thirty – four
$2n-13=9$	Twice n minus thirteen is equal to nine
$5(b+28)=150$	Five times the sum of b and twenty - eight is equal to one hundred fifty
$\frac{2}{3}a+2=9$	Two - thirds of a added to two is equal to nine
$56/w-2=3$	fifty - six divided by the difference of w and two is equal to three
$4(32-3x)=2$	Four multiplied to the difference of thirty - two and the product of x and three is equal to two
$\frac{1}{2}(5n-1)=5$	One - half of the difference of the product of five and n and one is equal to five
$5y-9=13$	Five times <i>y</i> less than nine is equal to thirteen

Answers/**Audio #1 -Technology**

What would we do without technology? Would we still be living in caves? Probably. I think there are two main kinds of technology. The kinds before and after computers. When we think about technology before computers, it was quite basic. It was all mechanical. Things like steam trains and fridges. At the time, that was cutting edge technology. But, today's technology is really cutting edge. It's the kind of technology that is out of date as soon as it hits the shelves. I love this. It's so exciting seeing it all happen. I love reading about what technology we'll have in the future, and then buy it a few years later. It's like buying technology from science fiction movies. I'd love to live to be 200 so I can see what technology is around then.

Audio #2 -Science

Science is one of the most important subjects we study at school. I loved it. I thought it was so interesting. Time in my science lessons went very quickly because I was always working on things and doing experiments. I liked all of the sciences, physics, biology and chemistry. I wish I continued studying science. I would love to be a scientist now. I think being a computer scientist would be great. Science is so important for our life and our world. All of the world's problems can be solved with science. We can go to different planets because of science. I hope governments pump lots of money into science so we have more and better scientists in the future. It's interesting to think about what future science will be like.

Full text

Audio #3 Organizing a group project

Cara: So for our group project, do you want to start this week?

Selim: Yeah, I want to start early so we have enough time.

Robert: Me too, but I've got a big math's project too.

Cara: How about we meet first to plan what we're going to do? Just for an hour.

Robert: Good idea, Cara.

Cara: When are you free?

Robert: I can always do mornings before 10.

Cara: Robert ... Uh ...

Selim: I'm sleeping before 10!

Robert: OK! OK, so when are you two free?

Cara: Wednesdays are good for me. But not very early, please!

Selim: I can't do the mornings on Wednesdays but I have 3 till 5 free.

Robert: I can do 4 o'clock, just before my maths class.

Cara: Great, 4 then. Where shall we meet?

Selim: The library?

Robert: I don't know. The library isn't a good place for a planning meeting as we can't talk in there.

Cara: How about the university café? It's near the library. We can talk in there. And eat cake.

Selim: Cake is good.

Robert: OK, so Wednesday at the café. I need to leave at ten to five to go to my math's class.

Cara: No problem. Planning will take less than an hour.

Selim: OK! See you Wednesday for cake.

Robert and Cara: See you, Selim!

Audio #4 : Robots

A long time ago, robots belonged to [science](#) fiction. Children loved looking at movies with robots. Today, robots are real, and they are helping us. In the future, we will all have robots. They will vacuum the floor, wash the dishes, perhaps even drive our cars. I even think one day we'll have robot friends. In Japan today, robot engineers are making robots to help old people and to keep them company. It's still early days. I'd say we are another 20 to 30 years away from robots being everywhere in our lives. What will happen to us when the world is full of robots? There'll be no jobs. McDonalds will be full of smiling robots. Maybe one day we won't be able to tell robots and humans apart. Maybe they'll take over the world.

Section 1.7

Text

While **generative AI** has been **grabbing the headlines** lately, the world of **robotics** has been developing at a **rapid clip**. The **robot** industry has been expanding exponentially, albeit mainly outside the **spotlight** of the **mass media**.

And, as MSN explains, business is **booming**:

According to an announcement by the International Federation of Robotics, the **stock** of **operational** robots around the world has now reached 3.5 million **units**, and the **value** of **installations** has reached an **estimated** \$16 billion. According to the Federation, robotics now **plays a fundamental role** in the changing **demands** of manufacturers around the world.

Of course, talk of robots will immediately **call to mind automotive** manufacturing, and car-makers were certainly one of the **earliest adopters**. But it's not just the automotive industry anymore. Robots are being **deployed** on smaller **scales**, alongside humans, outside of **assembly-line** manufacturing. Robots have found **applications** throughout the economy, for companies big and small, as Yahoo notes:

SMEs are increasingly adopting **collaborative** robots, leading to significant economic opportunities in the industry. These "**cobots**" provide SMEs with a cost-effective and **customizable automation** option. This is especially **tempting** considering the lower **startup** and operating costs compared to **traditional** robots.

This **affordability** and **versatility** enables SMEs to **implement** automation technologies that can **scale** with business growth.

Cobots have certainly made life easier for human workers. They also **enhance quality control** and efficiency, from a cost **perspective**. And while cobots are working alongside **flesh and blood** humans on many tasks, there are other jobs that can be completely automated. There are many **repetitive** human tasks that people find **soul-destroying**, or in which humans are unfortunately **prone to error**. This has **prompted** many companies to **embrace** what is called Robotic Process Automation. As Allied Market Research describes it:

Robotic process automation, or RPA, is an **emerging** technology that helps automate **routine** business practices using software **bots** to handle repetitive tasks. Its **use cases range** from telecom to retail, banking to accounting, healthcare to HR, and IT. RPA helps **enterprises** in

processing a transaction, **triggering** responses, **manipulating** data, and communicating with other digital systems.

As robots become more **ubiquitous**, they are becoming more deeply **embedded** in everyday life. It's not just about the **factory floor** anymore. Even service industries see robots as a **boon**, given the ongoing challenges in **recruitment** and **retention**. A **prominent case in point** is the healthcare industry. For example, tests in hospital settings are revealing the **promise** that robots **hold**. As Time magazine reports:

The results of the tests showed that robots were able to **perform** routine tasks like greeting **patients**, providing directions, and answering questions during the **initial trial**. They were also able to understand group conversations and **facilitate**

assistance based on what patients asked of them. These **advances** were made possible by the progress seen in **large language models**, the type of **artificial intelligence** that powers **ChatGPT**.

As noted, this kind of human-robot **interaction** requires robots to have a certain **degree** of intelligence. Moving beyond **menial** or repetitive tasks has required advances in the related **field** of artificial intelligence. While AI is **overshadowing** robotics in the media, robots actually rely heavily on AI to do what they do, as Forbes explains:

AI is **transforming** robotics, although we are still in the early stages of developing use cases. Companies are now developing advanced robots equipped with AI that can learn and **adapt** to new tasks. They now function in **real-world** situations that **pre-programmed** systems frequently fail to operate **autonomously** in. The overall goal is that by combining highly **reliable** but inflexible technology like robotics with a highly flexible but less reliable technology like AI **algorithms**, you will get **the best of both worlds**.

As we've seen, the use of robots is no longer **confined** to the automotive industry, or even manufacturing more broadly. They're appearing in all kinds of human **settings**, from healthcare to hospitality. Could it be that robots are the solution to the ongoing hiring **crisis**? Or could it be that humans will finally be **relieved** of painful or boring tasks? As the Business Reporter tells it:

The **transition** from industrial to intelligent robotics is already transforming industrial processes and is set to do so **well into the future**. Designed into the robots of today is a sense of freedom and autonomy – they now have a level of intelligence that means they can make their own decisions, free of human **interference**. This in turn **frees up** human labor to focus on the jobs robots cannot do. **In short**, their impact on industry, as well as **work-life balance**, will be **game-changing**.

A. Collocations

1/g, 2/d, 3/h, 4/b, 5/a, 6/c, 7/f, 8/e

B. Vocabulary Quiz

1/c, 2/b, 3/c, 4/c, 5/b, 6/c, 7/a, 8/b, 9/c, 10/a