Independent Skill Development Mission

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ISDM (INDEPENDENT SKILL DEVELOPMENT MISSION)

WHAT IS ROBOTICS? INTRODUCTION TO MECHANICAL & ELECTRICAL COMPONENTS

📌 CHAPTER 1: UNDERSTANDING ROBOTICS

1.1 What is Robotics?

Robotics is the field of technology that focuses on the design, construction, operation, and programming of robots. A **robot** is a machine designed to perform tasks automatically, either independently or under human control. Robotics combines various disciplines, including **mechanical engineering, electrical engineering, computer science, and artificial intelligence** to create intelligent and automated systems.

1.2 Importance of Robotics in Modern Society

✓ **Automation:** Robots help in manufacturing industries, reducing human workload.
✓ **Healthcare:** Robots assist in surgeries and patient care.
✓ **Exploration:** Robots are used in space, deep-sea exploration, and hazardous environments.
✓ **Smart Assistants:** AI-powered robots like Alexa and Siri assist in daily tasks.

1.3 Types of Robots

- **Industrial Robots:** Used in factories for manufacturing (e.g., robotic arms in car assembly).
- **Humanoid Robots:** Robots that resemble humans (e.g., Sophia the AI robot).
- **Autonomous Robots:** Self-driving vehicles and drones.
- **Medical Robots:** Robots assisting in surgeries and prosthetics.

📌 Chapter 2: Introduction to Mechanical Components in Robotics

2.1 Key Mechanical Components in Robotics

Robots rely on mechanical structures to perform movements and interact with the environment. Some key mechanical components include:

✓ **Frame & Body:** The structure of the robot, usually made of metal or plastic.
✓ **Motors:** Convert electrical energy into mechanical movement.
✓ **Gears & Belts:** Help transfer motion from motors to different parts of the robot.
✓ **Wheels & Tracks:** Used in mobile robots to allow movement.
✓ **Joints & Actuators:** Enable movement in robotic arms and humanoid robots.

2.2 Types of Motion in Robots

- **Rotary Motion:** Spinning or rotating parts like wheels and gears.
- **Linear Motion:** Straight movement using rails or sliders.
- **Articulated Motion:** Movement using joints, similar to a human arm.

📌 Chapter 3: Introduction to Electrical Components in Robotics

3.1 Key Electrical Components in Robotics

Robots require electrical systems to function, sense, and interact with their surroundings. Essential electrical components include:

✓ **Power Supply:** Provides energy to the robot (batteries, solar panels).
✓ **Microcontroller:** The "brain" of the robot that processes information and controls movement.
✓ **Sensors:** Allow the robot to detect surroundings (e.g., ultrasonic, infrared, touch sensors).
✓ **Wires & Circuits:** Connect electronic components and transmit power and signals.
✓ **LEDs & Displays:** Provide visual feedback for communication.

3.2 Types of Sensors in Robotics

- **Ultrasonic Sensors:** Measure distance using sound waves.
- **Infrared Sensors:** Detect heat and obstacles.
- **Touch Sensors:** Allow robots to feel pressure or contact.
- **Light Sensors:** Detect brightness and colors.

📌 Chapter 4: Integration of Mechanical & Electrical Components in Robotics

4.1 How Mechanical & Electrical Components Work Together

A fully functional robot combines mechanical and electrical components to complete tasks efficiently. For example:
✓ **Motors receive signals from the microcontroller** to move robot

arms or wheels.

✓ **Sensors detect obstacles** and send feedback to the microcontroller, allowing the robot to avoid them.

✓ **The power supply energizes the electrical circuits**, ensuring smooth functioning of all parts.

4.2 Real-World Example: Self-Driving Car

- **Mechanical Components:** Wheels, steering mechanisms, braking system.
- **Electrical Components:** GPS, cameras, sensors, microcontroller.
- **Working Together:** The sensors detect obstacles, the microcontroller processes the data, and the motors adjust the car's movement accordingly.

📌 Chapter 5: Exercises & Assignments

5.1 Multiple Choice Questions

1. What is the purpose of robotics?
    - (a) Only for gaming
    - (b) To automate tasks and assist humans ✅
    - (c) To replace humans completely
    - (d) To make toys
2. What is the role of a microcontroller in a robot?
    - (a) Provides power
    - (b) Controls and processes data ✅
    - (c) Helps the robot move

- (d) Detects objects

3. Which sensor helps a robot detect obstacles?
   - (a) Light sensor
   - (b) Temperature sensor
   - (c) Ultrasonic sensor ✅
   - (d) Pressure sensor

5.2 Practical Assignment

📌 **Task 1:** Draw and label a basic robot, showing mechanical and electrical components.
📌 **Task 2:** Research and write about a real-world robot and how its mechanical and electrical components work together.

📌 CHAPTER 6: SUMMARY

✅ Robotics is the combination of **mechanical, electrical, and programming elements** to create intelligent machines.
✅ **Mechanical components** include motors, wheels, gears, and joints for movement.
✅ **Electrical components** like microcontrollers, sensors, and power supplies allow robots to sense and interact with the environment.
✅ Both **mechanical and electrical components** must work together for a robot to function properly.

Study Material: Types of Robots (Humanoid, Industrial, Service, AI-powered Robots)

📌 Introduction to Robotics

Robots are **automated machines** that perform tasks with minimal human intervention. Robotics integrates **engineering, computer science, and AI** to create machines that assist or replace human efforts in various fields. Robots can be categorized based on their design, function, and intelligence levels.

The main types of robots include:

1. **Humanoid Robots** 🤖
2. **Industrial Robots** 🏭
3. **Service Robots** 🏡
4. **AI-powered Robots** 🌐

Each type of robot serves a different purpose and has unique characteristics. Let's explore them in detail!

🤖 1. Humanoid Robots

📌 What are Humanoid Robots?

Humanoid robots resemble **the human body structure** and behavior. They are designed to **mimic human movement, speech,**

and interaction. Some humanoid robots are equipped with **AI** to perform tasks like conversation, assistance, and entertainment.

- **Characteristics of Humanoid Robots:**

✓ **Bipedal structure** (Two-legged like humans)
✓ **Facial expressions & gestures**
✓ **AI for speech recognition & decision-making**
✓ **Sensors for interaction** with the environment

- **Examples of Humanoid Robots:**

1. **Sophia (Hanson Robotics)** – AI-powered humanoid robot capable of conversation.
2. **ASIMO (Honda)** – A humanoid robot designed for assisting in daily activities.
3. **Atlas (Boston Dynamics)** – Advanced humanoid robot capable of running and jumping.

- **Applications of Humanoid Robots:**

✓ **Customer Service** – Used in malls, hotels, and airports for guiding customers.
✓ **Education & Research** – Helps students learn robotics & AI concepts.
✓ **Healthcare & Assistance** – Assists elderly and disabled individuals.

🏭 2. Industrial Robots

📌 What are Industrial Robots?

Industrial robots are **high-speed, high-precision machines** used in manufacturing and production lines. They are programmed to perform **repetitive and heavy-duty tasks** with accuracy.

- **Characteristics of Industrial Robots:**

✓ **Automated & Programmable**
✓ **Capable of Heavy Lifting**
✓ **High-Speed & Precision Control**
✓ **Fixed or Mobile Design**

- **Examples of Industrial Robots:**

1. **Robotic Arms (ABB, Fanuc, KUKA)** – Used in car manufacturing.
2. **SCARA Robots** – Fast-moving robots for assembly lines.
3. **Delta Robots** – Used in food and electronics packaging.

- **Applications of Industrial Robots:**

✓ **Car Manufacturing** – Welding, painting, assembling.
✓ **Electronics Assembly** – Circuit board manufacturing.
✓ **Food Processing** – Sorting and packaging products.

🏠 3. Service Robots

📌 What are Service Robots?

Service robots are designed to **help humans in everyday life** and provide **assistance in domestic, medical, and commercial sectors.**

- **Characteristics of Service Robots:**

✓ **User-friendly interface**
✓ **Autonomous movement**
✓ **AI-powered decision-making**
✓ **Sensors for navigation & interaction**

- **Examples of Service Robots:**

1. **Roomba (iRobot)** – A robotic vacuum cleaner for home cleaning.
2. **Pepper (Softbank Robotics)** – A robot used for customer service.
3. **Surgical Robots (Da Vinci System)** – Used for precise medical surgeries.

- **Applications of Service Robots:**

✓ **Home Assistance** – Cleaning, security surveillance.
✓ **Healthcare** – Assisting doctors in surgeries and patient monitoring.
✓ **Hospitality & Retail** – Greeting and guiding customers.

🌐 4. AI-POWERED ROBOTS

📌 What are AI-powered Robots?

AI-powered robots use **artificial intelligence** to **learn, adapt, and make decisions** without explicit programming. They are **self-learning** and improve over time based on data.

- **Characteristics of AI-powered Robots:**

✓ **Machine Learning Capabilities**
✓ **Autonomous Decision-Making**
✓ **Real-Time Data Processing**
✓ **Adaptive & Self-Improving Behavior**

- **Examples of AI-powered Robots:**

1. **Tesla's Self-Driving Cars** – AI-powered vehicles with self-driving capabilities.
2. **Boston Dynamics' Spot** – AI-driven robotic dog used for surveillance.
3. **AI Chatbots (GPT-based Assistants)** – Virtual assistants that learn from conversations.

- **Applications of AI-powered Robots:**

✓ **Autonomous Vehicles** – Self-driving cars and drones.
✓ **Security & Surveillance** – AI-powered robots for monitoring.
✓ **Medical Diagnosis** – AI robots analyzing health data.

📊 Comparison of Different Types of Robots

Feature	Humanoid Robots 🤖	Industrial Robots 🏭	Service Robots 🏡	AI-powered Robots 🌐
Looks Like a Human	✅	❌	❌	❌

Uses AI for Decision Making	✅	❌	✅	✅
Works in Factories	❌	✅	❌	✅
Helps in Daily Life	✅	❌	✅	✅
Fully Autonomous	❌	✅	✅	✅

📝 Exercise: Multiple Choice Questions (MCQs)

1. Which type of robot is designed to look and behave like a human?

- ☐ A) Industrial Robot
- ☐ B) AI-powered Robot
- ☐ C) Humanoid Robot ✅
- ☐ D) Service Robot

2. What is the primary use of industrial robots?

- ☐ A) Assisting in surgeries
- ☐ B) Manufacturing & heavy lifting ✅
- ☐ C) Cleaning houses
- ☐ D) Teaching students

3. Which of the following is a service robot?

- [ ] A) SCARA Robot
- [ ] B) Pepper Robot ✅
- [ ] C) Boston Dynamics' Atlas
- [ ] D) None of the above

4. What is the main characteristic of AI-powered robots?

- [ ] A) Pre-programmed functions
- [ ] B) Self-learning and adaptive behavior ✅
- [ ] C) Fixed movement patterns
- [ ] D) No intelligence

5. Which robot is commonly used for self-driving technology?

- [ ] A) Spot Robot
- [ ] B) Tesla's Autonomous Cars ✅
- [ ] C) Roomba Vacuum Cleaner
- [ ] D) ASIMO

📜 Summary & Key Takeaways

✓ **Humanoid Robots** – Designed to resemble humans and interact with people.
✓ **Industrial Robots** – Used in factories for automation and heavy lifting.
✓ **Service Robots** – Help in daily activities like cleaning and customer service.
✓ **AI-powered Robots** – Learn and adapt using artificial intelligence.

Understanding Robotics Kits: Motors, Sensors, Processors, & Power Sources

📌 Introduction

Robotics kits are designed to provide students and hobbyists with **hands-on experience in building and programming robots**. These kits typically include **motors, sensors, processors (microcontrollers), and power sources**, which are essential components for enabling robots to move, sense their environment, process information, and operate efficiently.

This study material explores **each of these key components** in detail, explaining their functions, types, and real-world applications.

🚀 Chapter 1: Motors in Robotics

1.1 What Are Motors?

Motors are devices that **convert electrical energy into mechanical movement**. In robotics, motors are used to enable movement, such as driving wheels, moving arms, or rotating joints.

1.2 Types of Motors in Robotics

Motor Type	Function	Example Application
DC Motor	Provides continuous rotation in one or both directions.	Robotic cars, conveyor belts

Servo Motor	Controls precise angular movement (0° to 180° or 360°).	Robotic arms, humanoid robots
Stepper Motor	Moves in fixed steps, allowing precise positioning.	3D printers, CNC machines
Brushless Motor	High-speed, efficient motors with minimal wear.	Drones, electric vehicles

1.3 How Motors Work in Robotics Kits

✓ Controlled using a **microcontroller** (like Arduino, Raspberry Pi, or LEGO Mindstorms).
✓ Speed and direction are managed via **motor drivers**.
✓ Some motors require **external power sources** due to high energy consumption.

1.4 Hands-on Example: Controlling a DC Motor

Using a microcontroller like **Arduino** to control a **DC motor** with a motor driver (L298N).

```
int motorPin1 = 9; // Connect to motor driver

int motorPin2 = 10;


void setup() {

  pinMode(motorPin1, OUTPUT);

  pinMode(motorPin2, OUTPUT);

}
```

```
void loop() {
  digitalWrite(motorPin1, HIGH);
  digitalWrite(motorPin2, LOW);
  delay(2000); // Motor runs for 2 seconds
}
```

🤖 Chapter 2: Sensors in Robotics

2.1 What Are Sensors?

Sensors help robots **perceive their environment** by detecting light, sound, obstacles, temperature, and more. These inputs allow robots to make decisions.

2.2 Types of Sensors in Robotics Kits

Sensor Type	Function	Example Application
Ultrasonic Sensor	Measures distance using sound waves.	Obstacle detection in self-driving cars
Infrared (IR) Sensor	Detects objects based on infrared light reflection.	Line-following robots
Touch Sensor	Detects physical contact (pressed or released).	Elevator buttons, safety robots
Light Sensor	Measures brightness levels.	Solar robots, street lights

Gyroscope & Accelerometer	Measures tilt, rotation, and acceleration.	Drones, balancing robots

2.3 How Sensors Work in Robotics Kits

✓ Sensors send **electrical signals** to the **processor/microcontroller**.
✓ The microcontroller **processes the data** and responds (e.g., stopping the robot if an obstacle is detected).
✓ Sensors **enhance robot autonomy** by making decisions based on real-world data.

2.4 Hands-on Example: Using an Ultrasonic Sensor with Arduino

Using an **HC-SR04 Ultrasonic Sensor** to detect distance.

```
#define trigPin 9

#define echoPin 10


void setup() {

 Serial.begin(9600);

 pinMode(trigPin, OUTPUT);

 pinMode(echoPin, INPUT);

}


void loop() {

 digitalWrite(trigPin, LOW);

 delayMicroseconds(2);
```

```
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  long duration = pulseIn(echoPin, HIGH);
  int distance = duration * 0.034 / 2;
  Serial.println(distance);
  delay(500);
}
```

📄 Chapter 3: Processors in Robotics (Microcontrollers & Microprocessors)

3.1 What Are Processors?

Processors (microcontrollers or microprocessors) are the **brains of the robot**, responsible for processing sensor data and controlling motors.

3.2 Difference Between Microcontrollers & Microprocessors

Feature	Microcontroller (MCU)	Microprocessor (MPU)
Definition	Small computer with CPU, memory, and I/O on a single chip.	High-performance CPU requiring external memory and peripherals.

Use Case	Used in embedded systems (robots, IoT devices).	Used in computers, advanced AI robots.
Example	Arduino, Raspberry Pi Pico	Raspberry Pi, NVIDIA Jetson

3.3 Popular Robotics Kits Processors

✓ **Arduino Uno** – Best for beginners in robotics coding.
✓ **Raspberry Pi** – Ideal for AI-powered robots.
✓ **LEGO Mindstorms EV3 Brick** – Designed for educational robotics.

3.4 How Processors Work in Robotics Kits

✓ Reads sensor data **(input signals)**.
✓ Processes the data using **predefined algorithms**.
✓ Sends commands to motors **(output signals)** for movement.

🔋 Chapter 4: Power Sources in Robotics

4.1 Why Power Sources Are Important?

✓ Provide **electricity to sensors, motors, and processors**.
✓ Ensure robots operate efficiently **without interruptions**.
✓ Different robots require **different power sources** depending on their size and function.

4.2 Types of Power Sources in Robotics

Power Source	Function	Example Application

Battery Pack (Li-ion, NiMH, Lead Acid)	Portable power source for mobile robots.	Remote-controlled robots
USB Power Bank	Powers small robots & development boards.	Raspberry Pi-based projects
Solar Panels	Converts sunlight into electrical energy.	Solar-powered robots
Wired Power Supply	Direct power from wall outlets for stationary robots.	Industrial robots

4.3 How to Choose the Right Power Source

✓ **Low-power robots** (educational kits) → Use **AA batteries or USB power banks**.
✓ **High-power robots** (drones, humanoids) → Use **Li-ion rechargeable batteries**.
✓ **Industrial robots** (factory automation) → Use **wired power sources**.

4.4 Safety Tips for Power Sources

- Always use **proper voltage and current ratings** to avoid damage.
- Charge **rechargeable batteries** correctly to prevent overheating.
- Never **mix old and new batteries** in a robot.

📜 Conclusion

Understanding the components of a **robotics kit—motors, sensors, processors, and power sources**—is essential for building and programming robots.

✓ **Motors** control movement.
✓ **Sensors** allow robots to interact with their environment.
✓ **Processors** are the brain of the robot.
✓ **Power sources** ensure robots function correctly.

🎯 Quiz: Test Your Knowledge!

1. What type of motor allows **precise angular movement**?
A) DC Motor
B) Servo Motor ✅
C) Stepper Motor
D) Brushless Motor

2. Which **sensor detects obstacles using sound waves**?
A) Infrared Sensor
B) Touch Sensor
C) Ultrasonic Sensor ✅
D) Gyroscope

3. What is the **brain of a robot**?
A) Motor
B) Processor ✅
C) Sensor
D) Battery

4. Which **battery type is commonly used in robotics**?
A) NiMH

B) Li-ion ✅

C) AA

D) Lead Acid

Robotics Safety Guidelines & Proper Handling of Components

🔹 Chapter 1: Importance of Robotics Safety

Why is Safety Important in Robotics?

✓ Prevents injuries caused by mechanical parts.
✓ Protects electronic components from damage.
✓ Ensures a smooth and efficient learning process.
✓ Encourages responsible use of robotics equipment.
✓ Reduces risks of short circuits, overheating, and fire hazards.

📌 **Example:**
A student accidentally touches an exposed wire without checking if the power is off, leading to an electric shock. Following safety guidelines can **prevent such incidents**.

🔹 Chapter 2: General Safety Guidelines in Robotics

1. Basic Safety Rules

✅ Always wear safety goggles when working with robots.
✅ Tie back long hair and avoid loose clothing near moving parts.
✅ Keep your workspace clean and organized.
✅ Do not touch moving parts while the robot is running.
✅ Never work with robots in wet or damp conditions.
✅ Keep food and drinks away from electronic components.

2. Electrical Safety Guidelines

- Disconnect the power before working on electrical components.
- Use insulated tools when handling electrical circuits.
- Check wires and connections for damage before use.
- Avoid touching exposed wires or circuits.
- Do not overload power sources.

📌 **Example:**
Before connecting a sensor to the robot, ensure the **power supply is OFF** to avoid electrical shocks or short circuits.

🔹 Chapter 3: Proper Handling of Robotics Components

1. Mechanical Parts Handling

✓ Be cautious when handling sharp edges of metal parts.
✓ Use screws and fasteners correctly to secure parts.
✓ Always test joints and connections before running the robot.

2. Handling Motors & Servos

✓ Never force a motor to turn manually—it may damage the internal gears.
✓ Ensure motors are **properly secured** before running tests.
✓ Avoid placing fingers near rotating motors to prevent pinching injuries.

3. Handling Sensors & Microcontrollers

✓ Do not apply excessive force when inserting wires into ports.
✓ Keep electronic components away from magnets and heat sources.

✓ Always connect components according to the correct voltage requirements.

📌 **Example:**
When inserting wires into a **microcontroller board,** push them gently instead of forcing them in**,** which can **damage the ports**.

🔹 Chapter 4: Safe Use of Robotics Tools

Tool	**Safety Guideline**
Screwdrivers	Use the correct size to avoid slipping.
Pliers	Hold wires firmly without excessive pressure.
Soldering Iron	Keep away from skin and use only in ventilated areas.
Wrenches	Tighten screws securely but avoid over-tightening.
Hot Glue Gun	Handle with caution to prevent burns.

📌 **Example:**
A student using a **hot glue gun** to attach components should be careful not to **touch the nozzle** to avoid burns.

🔹 Chapter 5: Safe Robot Testing & Operation

✅ Test robots in a **clear area** away from people.
✅ Always have a **"STOP" button or emergency shut-off method**.
✅ Do not stand directly in front of a moving robot.
✅ Start testing at **low speed** before increasing movement speed.
✅ Use **remote control or programming** to control robots safely.

📌 **Example:**
Before testing a robot, ensure all team members **stand at a safe distance** and are aware of emergency stop procedures.

🔹 Chapter 6: Teamwork & Responsibility in Robotics

🤝 Assign roles: Builder, Programmer, Safety Manager, and Tester.
🛠️ Encourage **communication and teamwork** to avoid mistakes.
📋 Keep **safety checklists** before running tests.

📌 **Example:**
The **Safety Manager** should double-check wiring and ensure all tools are stored properly before testing.

🔹 Chapter 7: Robotics Safety Do's & Don'ts

Do's ✅	**Don'ts** ❌
Wear safety goggles & gloves when necessary.	Never touch exposed wires.
Keep the workspace clean & organized.	Do not run robots near other students.
Disconnect power before making wiring changes.	Avoid using damaged cables or components.
Test robots in a controlled space.	Never test robots on uneven surfaces.

🎯 Summary of Robotics Safety Guidelines

✅ Always follow **basic safety rules** to prevent accidents.
✅ Handle **electrical and mechanical components** with care.
✅ Use **the right tools correctly** to avoid injuries.
✅ Perform **safety checks** before running robots.
✅ Work as a **team** to ensure a **safe robotics environment**.

📌 Final Assignment: Safety Checklist Activity

✅ **Create a safety checklist** for your robotics project.
✅ Identify **five potential hazards** in a robotics lab and suggest ways to prevent them.
✅ **Present your safety checklist** to the class.

📌 ASSIGNMENT:

☑ RESEARCH AND WRITE ABOUT A FAMOUS REAL-WORLD ROBOT AND ITS FUNCTION.

📌 Assignment Solution: Research and Write About a Famous Real-World Robot

🎯 Objective:

The goal of this assignment is to help students understand the role of robotics in the real world by researching and writing about a famous robot. This step-by-step guide will help structure your research and writing process effectively.

🛠️ Step 1: Choose a Famous Robot

First, select a robot that interests you. Below are some well-known robots from different industries:

🚀 Space & Exploration Robots:

- **Curiosity Rover (NASA)** – A robot exploring Mars.
- **Perseverance Rover (NASA)** – A Mars rover with advanced AI.

🏥 Healthcare & AI-Powered Robots:

- **Da Vinci Surgical Robot** – Assists doctors in surgeries.
- **Sophia the Humanoid Robot (Hanson Robotics)** – A social AI-powered robot.

🏭 Industrial & Service Robots:

- **Boston Dynamics' Spot** – A robot used for inspections and surveillance.
- **ASIMO (Honda)** – A humanoid robot assisting with tasks.

🔹 **Tip:** Choose a robot that excites you and is well-documented for research.

📝 Step 2: Conduct Research

Now, gather important details about the chosen robot. You can use the following sources:

✓ **Official Websites:** NASA, Hanson Robotics, Boston Dynamics
✓ **News Articles & Tech Blogs:** Wired, TechCrunch, Robotics Today
✓ **Videos & Documentaries:** YouTube, National Geographic, Discovery Channel

Focus on collecting the following information:

- **Who created the robot?** (Company or organization)
- **When was it created?** (Year of invention)
- **What is its function?** (Purpose of the robot)
- **How does it work?** (Mechanical and AI components)
- **Why is it important?** (Impact on society and the future)

🔹 **Tip:** Take organized notes so that writing your article is easier.

🖊 Step 3: Write the Article

Your article should be structured into the following sections:

1. Introduction

Begin with an interesting fact or question to capture attention. Then, introduce your chosen robot and its significance.

Example:
*"Did you know that robots are currently exploring space on behalf of humans? One of the most famous robots is the **Curiosity Rover**, which has been analyzing the Martian surface since 2012!"*

---

2. History and Development

Explain the background of the robot, including:

✓ **Who developed it?** (Company or scientists behind the project)
✓ **When and why was it created?**
✓ **What challenges were faced during its development?**

Example:
"Curiosity Rover was developed by NASA's Jet Propulsion Laboratory and launched on August 6, 2012. It was created to explore Mars and analyze its surface for signs of ancient life. Scientists faced the challenge of designing a robot that could withstand extreme temperatures and navigate rough terrain."

---

3. Function and Features

Describe what the robot does and how it works:

✓ **What is its purpose?** (Exploration, surgery, assistance, etc.)
✓ **What are its key features?** (Cameras, sensors, AI capabilities)
✓ **How does it move or operate?**

Example:
"Curiosity is equipped with advanced cameras, a robotic arm, and a laser to study Martian rocks. It has six wheels that allow it to move across rough surfaces, and it sends valuable data back to NASA."

4. Impact and Importance

Explain why the robot is significant in its field:

✓ **How does it help humans?**
✓ **What problems does it solve?**
✓ **How does it contribute to future advancements?**

Example:
"Curiosity has helped scientists confirm that Mars once had water, which is a major discovery in the search for extraterrestrial life. It continues to send valuable data, helping NASA prepare for future manned missions to Mars."

---

5. Conclusion

Summarize the key points and give a personal opinion on why this robot is important.

Example:
"Curiosity Rover is one of the most remarkable robots ever built. Its mission has expanded our understanding of Mars, and future rovers will build upon its discoveries. Robotics like this are shaping the future of space exploration."

📸 Step 4: Add Visuals & References

✓ **Include images** of the robot to enhance your article.
✓ **Cite sources** from where you gathered information.

📌 Step 5: Final Review & Submission

- **Proofread** your work for spelling and grammar mistakes.
- **Ensure** the structure is clear and informative.
- **Submit** your assignment in the required format (Word, PDF, or a presentation).
