Electronics and Robotics Terms for Students

Understanding electronics is the first step in learning robotics. This guide explains important terms in simple language with examples, making it easy for students from Grade 3 to Grade 12 to grasp the concepts. Whether you're building a simple circuit or working on a robotics project, these definitions will help you understand the essential components and how they work.

1. Breadboard

A breadboard is a solderless prototyping board. It's a plastic board with a grid of interconnected holes, allowing you to easily connect electronic components without soldering. This makes it ideal for experimenting with circuits and testing ideas quickly. Breadboards are reusable, making them a cost-effective tool for learning electronics. **Applications:** Prototyping circuits, testing LED connections, building temporary projects, and educational demonstrations.

2. LED (Light Emitting Diode)

An LED is a semiconductor device that emits light when an electric current passes through it. LEDs are energy-efficient, long-lasting, and available in various colors. They have two leads: the longer lead is the Anode (positive), and the shorter lead is the Cathode (negative). Connecting them the wrong way won't damage the LED, but it won't light up. **Applications:** Indicator lights, displays, traffic lights, backlighting, decorative lighting.

3. Battery

A battery is a device that stores chemical energy and converts it into electrical energy. It provides a voltage that drives current through a circuit. Batteries have two terminals: positive (+) and negative (-). They come in various types, including rechargeable (like lithium-ion) and non-rechargeable (like alkaline). **Applications:** Powering portable electronics, toys, remote controls, flashlights, and powering circuits in robotics projects.

4. Resistor

A resistor is an electronic component that opposes the flow of electric current. It's measured in Ohms (Ω). Resistors are used to control current, protect sensitive components like LEDs from excess current, and create voltage dividers. They are identified by color-coded bands that indicate their resistance value. **Applications:** Current limiting (e.g., in LED circuits), voltage division, signal conditioning, timing circuits.

5. Anode (+)

The anode is the positive terminal of an electronic component. Current *enters* a component through the anode. It's essential to connect the anode to the positive side of a power source. In devices like LEDs and diodes, the anode is crucial for proper current flow and functionality. **Applications:** Connecting to the positive terminal of a battery or power supply, proper connection of LEDs and diodes.

6. Cathode (-)

The cathode is the negative terminal of an electronic component. Current *exits* a component through the cathode. It's essential to connect the cathode to the negative side of a power source. The cathode, along with the anode, completes the circuit, allowing current to flow. **Applications:** Connecting to the negative terminal of a battery or power supply, proper connection of LEDs and diodes.

7. Voltage (V)

Voltage is the electrical potential difference that pushes current through a circuit. It's measured in Volts (V). Think of it as the "pressure" that forces electrons to move. A higher voltage means a stronger "push." Voltage is what powers electronic components.

Applications: Powering electronic devices, providing the energy for circuits to function, determining the brightness of an LED.

8. Current (A)

Current is the flow of electric charge through a circuit. It's measured in Amperes (A). It's the amount of charge passing a point in a circuit per unit time. A higher current means more charge is flowing. Current is what powers devices like motors and lights. **Applications:** Powering motors, lighting up bulbs, operating electronic circuits, delivering power to components.

9. Capacitor

A capacitor is an electronic component that stores electrical energy in an electric field. It's like a tiny rechargeable battery, but it charges and discharges much faster. Capacitors are used for filtering, smoothing voltage, and storing energy for brief periods. **Applications:** Filtering noise in power supplies, storing energy for camera flashes, timing circuits, coupling signals.

10. Diode

A diode is a semiconductor device that allows current to flow in only one direction. It acts like a one-way valve for electricity. This property is useful for converting AC to DC and protecting circuits from reverse polarity. LEDs are a special type of diode that emits light. **Applications:** Rectifying AC to DC (e.g., in power supplies), protecting circuits from reverse voltage, signal modulation, LED lighting.

11. Transistor

A transistor is a semiconductor device that can amplify or switch electronic signals. It's a fundamental building block of modern electronics. Transistors are used in everything

from amplifiers and oscillators to logic gates and microprocessors. They come in various types, like BJTs and MOSFETs. **Applications:** Amplifying audio signals, switching circuits (e.g., in computers), building logic gates, controlling motors.

12. Microcontroller

A microcontroller is a small computer on a single integrated circuit (chip). It contains a processor, memory, and input/output peripherals. Microcontrollers are used to control electronic devices and automate tasks. They are the brains behind many embedded systems. **Applications:** Robotics control, home automation, industrial control, embedded systems, Arduino projects.

13. Sensor

A sensor is a device that detects physical changes (like temperature, light, pressure, or motion) and converts them into electrical signals. These signals can then be processed by a microcontroller or other electronic circuit. Sensors are essential for interacting with the environment. **Applications:** Temperature sensing (thermistors), light sensing (photoresistors), motion detection (accelerometers), pressure sensing, distance measurement (ultrasonic sensors).

14. Servo Motor

A servo motor is a type of motor that can be precisely positioned. Unlike regular motors that spin continuously, a servo motor can rotate to a specific angle and hold that position. This makes them ideal for applications requiring accurate control. **Applications:** Robotic arms, RC cars, animatronics, camera positioning, industrial automation.

15. Circuit

A circuit is a closed path through which electric current flows. It consists of a power source, conductors (wires), and components. For a circuit to function, it must be complete; if the path is broken, current will stop flowing. **Applications:** Household wiring, electronic devices, computer circuits, any system that uses electricity.

16. Switch

A switch is a device that opens or closes a circuit, controlling the flow of current. When the switch is closed, the circuit is complete, and current can flow. When the switch is open, the circuit is broken, and[1] current stops. Switches can be manual (like a light switch) or electronic (like a transistor). **Applications:** Turning lights on and off, controlling power to devices, selecting different circuits, enabling or disabling parts of a system.

17. Potentiometer

A potentiometer is a variable resistor. It has three terminals, and its resistance can be adjusted by turning a knob or slider. Potentiometers are used to control voltage or current in a circuit. **Applications:** Volume control in audio equipment, brightness control in lighting, adjusting motor speed, setting a reference voltage.

18. Fuse

A fuse is a safety device that protects circuits from overcurrent. It contains a thin wire that melts and breaks the circuit if too much current flows through it. This prevents damage to components and reduces the risk of fire. Fuses are designed to be sacrificial; they must be replaced after they blow. **Applications:** Protecting electronic devices from damage due to short circuits or overloads, preventing fires in electrical systems.

19. Crystal Oscillator

A crystal oscillator is an electronic component that generates a precise clock signal. It uses the piezoelectric effect of a quartz crystal to create a stable frequency. Crystal oscillators are essential for timing circuits and microcontrollers. **Applications:** Clocks, watches, microcontrollers, communication systems, generating precise timing signals.

20. Motor

A motor is a device that converts electrical energy into mechanical energy (motion). Motors are used in a wide range of applications, from small toys to large industrial machines. There are many types of motors, including DC motors, AC motors, and stepper motors. **Applications:** Fans, robots, electric vehicles, power tools, industrial machinery.

21. Rectifier

A rectifier is a circuit that converts alternating current (AC) into direct current (DC). Many electronic devices require DC power, but the power from the wall outlet is AC. Rectifiers are used in power supplies to convert AC to DC. **Applications:** Power supplies for electronic devices, battery chargers, converting AC power to DC power.

22. Buzzer

A buzzer is an electronic component that produces sound. It's typically used for alarms, notifications, and other audible signals. Buzzers can be piezoelectric or electromagnetic. **Applications:** Alarms, timers, doorbells, warning signals, toys.

23. Relay

A relay is an electrically operated switch. It uses a small current to control a larger current. Relays are used to isolate control circuits from high-power circuits and to

control multiple circuits with a single switch. **Applications:** Controlling lights with a low-voltage switch, controlling motors, automotive electronics, industrial control systems.

24. Inductor

An inductor is a coil of wire that stores energy in a magnetic field when current passes through it. Inductors are used for filtering, energy storage, and tuning circuits. They oppose changes in current flow. **Applications:** Filtering noise, energy storage in power supplies, tuning resonant circuits, radio frequency circuits.

25. Transformer

A transformer is a device that changes the voltage of AC power. It consists of two or more coils of wire wound around a common core. Transformers are used in power transmission, power supplies, and audio equipment. **Applications:** Stepping up or stepping down voltage, isolating circuits, impedance matching, power distribution.

26. Oscilloscope

An oscilloscope is an electronic instrument that displays waveforms of electrical signals. It allows you to visualize and analyze the voltage and timing of signals. Oscilloscopes are essential tools for electronics engineers and technicians. **Applications:** Analyzing circuit behavior, troubleshooting electronic equipment, measuring signal frequency and amplitude, testing electronic designs.

27. PCB (Printed Circuit Board)

A PCB is a board that connects electronic components using conductive tracks. It provides a mechanical support and electrical connections for the components. PCBs

are used in almost all electronic devices. **Applications:** Connecting electronic components, providing a structured layout for circuits, manufacturing electronic devices.

28. Actuator

An actuator is a device that converts energy into motion. It's a key component in robotics and automation. Actuators can be electric, hydraulic, or pneumatic. **Applications:** Robotic arms, valves, motors, solenoids, linear actuators.

29. Gear

A gear is a toothed wheel used to transmit motion and torque. Gears are used to change speed, torque, and direction of rotation. They are essential in mechanical systems. **Applications:** Transmitting power in machines, changing gear ratios, robotics, clocks, vehicles.

30. Encoder

An encoder is a device that converts motion into a digital signal. It provides feedback on position, speed, or direction. Encoders are used in robotics, motor control, and automation. **Applications:** Measuring motor position, controlling robotic arm movement, providing feedback in servo systems.

31. PWM (Pulse Width Modulation)

PWM is a technique for controlling the average power delivered to a device by varying the width of pulses. It's commonly used to control motor speed, LED brightness, and other applications. **Applications:** Motor speed control, LED dimming, power regulation, controlling servo motors.

32. H-Bridge

An H-bridge is a circuit that allows control of the direction of current through a load (e.g., DC motor). It's commonly used in robotics and motor control. **Applications:** Reversing the direction of a DC motor, controlling motor speed, robotics, motor drivers.

33. Infrared Sensor

An infrared sensor detects infrared light. It's used in remote controls, proximity sensors, and other applications. Some IR sensors emit IR light and detect the reflection. **Applications:** Remote controls, motion detectors, line following robots, proximity sensing.

34. Ultrasonic Sensor

An ultrasonic sensor uses sound waves to measure distance. It emits ultrasonic sound waves and measures the time it takes for the echo to return. Ultrasonic sensors are used in robotics, parking sensors, and other applications. **Applications:** Obstacle avoidance in robots, distance measurement, parking sensors, level sensing.

35. Stepper Motor

A stepper motor is a motor that moves in discrete steps. It's used for precise positioning and control. Stepper motors are commonly used in 3D printers, CNC machines, and robotics. **Applications:** 3D printers, CNC machines, robotics, precise positioning systems.

36. DC Motor

A DC motor is a motor that runs on direct current. It's a simple and widely used type of motor. DC motors are used in toys, fans, and other small devices. **Applications:** Toys, fans, small appliances, robotics projects.

37. AC Motor

An AC motor is a motor that runs on alternating current. It's commonly used in larger appliances and industrial applications. AC motors are known for their efficiency and reliability. **Applications:** Washing machines, industrial fans, pumps, power tools.

38. Thermistor

A thermistor is a resistor whose resistance changes with temperature. It's used for temperature sensing and control. **Applications:** Thermostats, temperature sensors, temperature control systems.

39. Photoresistor (LDR)

A photoresistor is a resistor whose resistance changes with light intensity. It's used for light sensing. **Applications:** Automatic streetlights, light meters, light-activated switches.

40. MOSFET (Metal-Oxide-Semiconductor Field-Effect Transistor)

A MOSFET is a type of transistor used for switching and amplifying signals. It's widely used in power electronics and motor control. **Applications:** Power supplies, motor drivers, amplifiers, switching circuits.

41. I2C (Inter-Integrated Circuit)

I2C is a serial communication protocol for connecting low-speed devices. It uses two wires: SDA (data) and SCL (clock). I2C is commonly used to connect sensors, displays, and other peripherals to microcontrollers. **Applications:** Connecting sensors, displays, EEPROMs, and other peripherals to microcontrollers.

42. SPI (Serial Peripheral Interface)

SPI is a serial communication protocol for high-speed data transfer. It uses multiple wires for communication. SPI is commonly used to connect microcontrollers to peripherals like displays, sensors, and memory. **Applications:** Connecting displays, sensors, memory devices, and other peripherals to microcontrollers.

43. UART (Universal Asynchronous Receiver-Transmitter)

UART is a serial communication protocol used for asynchronous communication. It's commonly used for connecting devices like GPS modules, Bluetooth modules, and computers. **Applications:** Connecting GPS modules, Bluetooth modules, serial communication with computers.

44. Joystick

A joystick is an input device used for controlling movement in multiple directions. It's commonly used in robotics, gaming, and remote control systems. **Applications:** Controlling robots, playing video games, controlling drones.

45. Accelerometer

An accelerometer measures acceleration forces. It's used to detect movement, tilt, and orientation. Accelerometers are commonly used in smartphones, fitness trackers, and robotics. **Applications:** Motion sensing, tilt detection, pedometers, orientation sensing.

46. RFID (Radio Frequency Identification)

RFID is a technology for identifying objects using radio waves. RFID tags store information that can be read by an RFID reader. RFID is used in access control, inventory management, and tracking. **Applications:** Access control, inventory management, tracking, contactless payment systems.

47. Bluetooth Module

A Bluetooth module enables wireless communication between devices using Bluetooth technology. It's used to connect peripherals like headphones, keyboards, and mice to computers and other devices. **Applications:** Wireless headphones, wireless keyboards, wireless mice, connecting mobile devices.

48. Wi-Fi Module

A Wi-Fi module allows electronic devices to connect to the internet wirelessly. It's used in IoT devices, smart home appliances, and other connected devices. **Applications:** Smart home devices, IoT devices, wireless internet connectivity.

49. LoRa (Long Range)

LoRa is a long-range, low-power wireless communication technology. It's used in IoT applications for data transmission over large distances. **Applications:** Smart agriculture, environmental monitoring, industrial IoT.

50. Robot

A robot is a machine capable of carrying out complex tasks automatically. Robots can be controlled by a human operator or autonomously through programming. They are used in manufacturing, healthcare, and many other fields. **Applications:** Manufacturing, healthcare, space exploration, automation.

51. RGB LED

An RGB LED is an LED that can produce a wide range of colors by mixing red, green, and blue light. It has four leads: one for each color (red, green, blue) and a common cathode or anode. By controlling the intensity of each color, you can create different colors. **Applications:** Mood lighting, indicator lights, displays, decorative lighting.

52. 7-Segment Display

A 7-segment display is a display device that can show numerical digits and some characters. It's made up of seven segments that can be individually lit. 7-segment displays are commonly used in calculators, digital clocks, and other electronic devices.

53. Logic Gate

Logic gates are fundamental building blocks of digital circuits. They perform logical operations (AND, OR, NOT, XOR, NAND, NOR) on binary inputs (0 and 1, representing "false" and "true," respectively) and produce a binary output. Understanding logic gates is crucial for grasping how computers and digital systems function at their core. They form the basis of all digital computation. **Applications:** Building computer processors, creating control circuits, implementing decision-making logic in robots, designing digital systems.

54. Integrated Circuit (IC)

An integrated circuit (IC), also known as a chip, is a miniaturized electronic circuit built on a small piece of semiconductor material (usually silicon). ICs contain thousands or even millions of components (transistors, resistors, capacitors, diodes) integrated together. They are the foundation of modern electronics, enabling complex circuits to be built in a small space. **Applications:** Microprocessors, memory chips, amplifiers, timers, logic circuits, almost all electronic devices.

55. Optocoupler (or Optoisolator)

An optocoupler (or optoisolator) is a device that uses light to transfer signals between two circuits while providing electrical isolation. It consists of an LED and a phototransistor separated by a transparent insulating barrier. The LED emits light when current flows through it, which is detected by the phototransistor, thus transferring the

signal. This isolation is crucial for protecting circuits from voltage spikes, noise, and ground loops. **Applications:** Isolating sensitive circuits, protecting microcontrollers from high-voltage circuits, signal isolation in industrial control systems, noise reduction.

56. Pulse

A pulse is a sudden, short-lived change in voltage or current. Pulses are used to transmit information in digital systems, where they represent binary digits (0 or 1). They are also used for timing purposes and triggering events. The width and frequency of pulses are important parameters. **Applications:** Digital communication, clock signals, timing circuits, triggering events in electronic systems, PWM control.

57. Frequency

Frequency is the number of cycles of a repeating signal (like a sine wave or a pulse wave) per unit time, usually per second. It's measured in Hertz (Hz). Frequency is a crucial concept in AC circuits, radio waves, digital signals, and sound waves. Higher frequency means more cycles per second. **Applications:** Radio communication, audio signals, clock signals in computers, AC power systems.

58. Amplifier

An amplifier is a circuit that increases the amplitude (strength) of a signal. Amplifiers are used in audio systems to make sound louder, in radio receivers to boost weak signals, and in many other applications where signal strength needs to be increased. They can amplify voltage, current, or power. **Applications:** Audio amplifiers, radio frequency amplifiers, operational amplifiers (op-amps), instrument amplifiers.

59. Microprocessor

A microprocessor is the "brain" of a computer. It's a complex integrated circuit that executes instructions and performs calculations. Microprocessors are found in computers, smartphones, tablets, and many other electronic devices. They fetch, decode, and execute instructions stored in memory. **Applications:** Computers, smartphones, tablets, embedded systems, controlling complex electronic devices.

60. Bus

A bus is a set of wires or other conductors used to transmit data between different parts of a computer or electronic system. It acts as a communication pathway. Buses can be parallel (transmitting multiple bits simultaneously) or serial (transmitting bits one after another). **Applications:** Connecting the CPU to memory, connecting peripherals to a computer, communication between different modules in a system.

61. Feedback

Feedback is a process where a portion of the output of a system is fed back to the input. Feedback can be positive (amplifying the input, leading to instability) or negative (stabilizing the input, improving accuracy). Negative feedback is crucial in control systems and robotics. **Applications:** Control systems (e.g., thermostats), amplifiers, robotics (e.g., controlling motor speed), stabilizing systems.

62. Algorithm

An algorithm is a set of rules or instructions for solving a problem or performing a task. Algorithms are essential for programming robots and other computer systems. They define the steps a computer must take to achieve a desired outcome. **Applications:** Robot control, image processing, data analysis, search engines, any computer program.

63. Serial Communication

Serial communication is a method of transmitting data one bit at a time over a single wire or channel. It's commonly used for communication between devices over longer distances or when the number of wires is limited. Examples include UART, SPI, and I2C. **Applications:** Connecting sensors to microcontrollers, communication between computers and peripherals, data transfer in embedded systems.

64. Parallel Communication

Parallel communication is a method of transmitting data multiple bits at a time over multiple wires or channels. It's faster than serial communication but requires more wires. It's typically used for short-distance, high-speed communication. **Applications:** Connecting components within a computer (e.g., CPU to memory), data transfer in high-speed systems.

65. Embedded System

An embedded system is a specialized computer system designed to perform a specific task within a larger system. It's often integrated into devices like appliances, automobiles, and industrial equipment. Embedded systems are typically real-time systems, meaning they must respond to events within strict time constraints. **Applications:** Washing machines, microwave ovens, automobiles, industrial controllers, medical devices.

66. Real-Time System

A real-time system is a system that must respond to events within strict time constraints. These systems are often used in critical applications where delays can have serious consequences. Embedded systems are often real-time systems. **Applications:** Industrial control systems, medical devices, robotics, flight control systems.

67. Microcontroller Programming

Microcontroller programming is the process of writing software to control the behavior of a microcontroller. It involves using a programming language (like C or C++) to write instructions that the microcontroller will execute. Microcontroller programming is essential for robotics and embedded systems development. **Applications:** Controlling robots, automating tasks, implementing control algorithms, interfacing with sensors and actuators.

68. Actuator Driver

An actuator driver is a circuit that controls the operation of an actuator (like a motor, solenoid, or valve). It provides the necessary current and voltage to the actuator and often includes features like speed control and direction control. **Applications:** Controlling motors in robots, driving solenoids in valves, controlling other actuators.

69. Sensor Interface

A sensor interface is a circuit that connects a sensor to a microcontroller or other electronic system. It often includes signal conditioning circuitry to amplify, filter, or linearize the sensor's output. **Applications:** Connecting temperature sensors, light sensors, pressure sensors, and other sensors to microcontrollers.

70. Power Supply

A power supply provides the necessary voltage and current to power electronic circuits. It converts AC power from the wall outlet to DC power at the appropriate voltage. Power supplies can be linear or switching. **Applications:** Powering electronic devices, providing power to circuits, converting AC to DC.

71. Ground

Ground is the reference point in an electrical circuit. It's the point to which all voltages are measured. Ground provides a return path for current and helps to prevent noise and interference. **Applications:** Providing a common reference point in circuits, preventing noise, ensuring proper circuit operation.

72. Short Circuit

A short circuit is a low-resistance path that bypasses the intended path of current in a circuit. Short circuits can cause excessive current flow, which can damage components and create fire hazards. **Applications:** (Undesirable) Can cause damage to components, overheating, fire hazards.

73. Open Circuit

An open circuit is a break in the path of current in a circuit. An open circuit prevents current from flowing. **Applications:** (Undesirable - unless intentional, like with a switch) Prevents current flow, stops circuit operation.

74. Ohm's Law

Ohm's Law states the relationship between voltage (V), current (I), and resistance (R) in a circuit: V = IR. It's a fundamental law of electronics that is used to calculate current, voltage, or resistance in a circuit. **Applications:** Calculating current, voltage, or resistance in a circuit, designing circuits, analyzing circuit behavior.

75. Kirchhoff's Laws

Kirchhoff's Laws are a set of two laws that describe the behavior of current and voltage in electrical circuits. Kirchhoff's Current Law (KCL) states that the sum of currents entering a junction is equal to the sum of currents leaving[1] the junction. Kirchhoff's Voltage Law (KVL) states that the sum of voltages around a closed loop is equal to

zero. **Applications:** Analyzing complex circuits, solving for unknown currents and voltages.

76. Noise

Noise is unwanted electrical signals that interfere with the desired signals in a circuit. Noise can be caused by various sources, such as electromagnetic interference, thermal noise, and power supply noise. It can degrade the performance of electronic circuits. **Applications:** (Undesirable) Can cause errors in digital systems, reduce signal quality, interfere with communication. Filtering and shielding are used to reduce noise.

77. Shielding

Shielding is the process of enclosing electronic circuits or cables in a conductive material to protect them from electromagnetic interference (EMI). Shielding helps to reduce noise and prevent unwanted signals from being picked up by the circuit. **Applications:** Protecting sensitive circuits from EMI, reducing noise in communication cables, shielding electronic equipment.

78. Filtering

Filtering is the process of removing unwanted frequencies from a signal. Filters can be designed to pass certain frequencies while blocking others. They are used to reduce noise, separate signals, and tune circuits. **Applications:** Removing noise from audio signals, separating radio signals, tuning resonant circuits.

79. Modulation

Modulation is the process of varying one or more properties of a carrier signal (like amplitude, frequency, or phase) to encode information. Modulation is used in

communication systems to transmit information over long distances. **Applications:** Radio communication, television broadcasting, data transmission.

80. Demodulation

Demodulation is the process of extracting the original information from a modulated carrier signal. It's the reverse of modulation. **Applications:** Radio receivers, television receivers, data receivers.

81. Bandwidth

Bandwidth is the range of frequencies that a communication channel can transmit. A wider bandwidth allows for the transmission of more data. **Applications:** Data transmission, radio communication, television broadcasting.

82. Latency

Latency is the delay between the time a signal is sent and the time it is received. Latency is an important consideration in real-time systems and communication systems. **Applications:** Real-time systems, communication systems, robotics.

83. Jitter

Jitter is the variation in the timing of a signal. It can cause errors in digital systems and degrade the quality of communication signals. **Applications:** Digital communication, real-time systems.

84. Protocol

A protocol is a set of rules and conventions that govern communication between devices. Protocols define how data is formatted, transmitted, and received.

Applications: Internet protocols (TCP/IP), serial communication protocols (UART, SPI, I2C), network protocols.

85. Baud Rate

Baud rate is the number of symbols or signal changes that occur per second in a communication channel. It's related to the data rate but not the same thing. **Applications:** Serial communication.

86. Data Rate

Data rate is the amount of data that can be transmitted per unit time. It's usually measured in bits per second (bps). **Applications:** Data transmission, network communication.

87. Packet

A packet is a unit of data that is transmitted over a network. Packets contain a header (with information about the packet) and a payload (the actual data). **Applications:** Network communication, internet communication.

88. IP Address

An IP address is a numerical identifier assigned to each device connected to a network. It's used to route packets to the correct destination. **Applications:** Internet communication, network communication.

89. MAC Address

A MAC address is a unique identifier assigned to each network interface card (NIC). It's used for communication on a local network. **Applications:** Local network communication.

90. Network

A network is a collection of interconnected devices that can communicate with each other. Networks can be local (LAN) or global (WAN, like the internet). **Applications:** Internet, local area networks, communication systems.

91. Internet

The internet is a global network of interconnected computer networks. It uses the TCP/IP protocol suite for communication. **Applications:** Worldwide communication, access to information, online services.

92. IoT (Internet of Things)

IoT is the network of interconnected devices embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. **Applications:** Smart home devices, wearable technology, industrial automation.

93. Robotics

Robotics is an interdisciplinary field that integrates computer science, mechanical engineering, and electrical engineering to design, construct, operate, and apply robots. **Applications:** Manufacturing, healthcare, exploration, automation.

94. Artificial Intelligence (AI)

AI is the ability of a computer or machine to mimic human intelligence, such as learning, problem-solving, and decision-making. **Applications:** Machine learning, natural language processing, computer vision.

95. Machine Learning (ML)

ML is a type of AI that allows computers to learn from data without being explicitly programmed. ML algorithms can identify patterns and make predictions. **Applications:** Image recognition, natural language processing, recommendation systems.

96. Computer Vision

Computer vision is a field of AI that enables computers to "see" and interpret images and videos. **Applications:** Image recognition, object detection, facial recognition.

97. Natural Language Processing (NLP)

NLP is a field of AI that focuses on enabling computers to understand and process human language. **Applications:** Chatbots, speech recognition, machine translation.

98. Sensor Fusion

Sensor fusion is the process of combining data from multiple sensors to get a more accurate and complete understanding of the environment. **Applications:** Robotics, autonomous vehicles, environmental monitoring.

99. Control System

A control system is a system that regulates the behavior of another system. It uses feedback to maintain a desired output. **Applications:** Thermostats, cruise control in cars, robotics.

100. Automation

Automation is the use of technology to automate tasks, reducing the need for human intervention. **Applications:** Manufacturing, robotics, industrial control.

101. Jumper Wires

Jumper wires are essential for prototyping and connecting components on breadboards or other prototyping systems. They come in various lengths and with different connector types:

- **Male-Male Jumper Wires:** These wires have male connectors (pins) on both ends. They are used to connect two female connectors or to plug into breadboard holes.
    - **Applications:** Connecting components on a breadboard, creating connections between different parts of a circuit.
- **Male-Female Jumper Wires:** These wires have a male connector (pin) on one end and a female connector (socket) on the other. They are used to connect a male connector to a female connector or to plug into a breadboard hole and connect to a component with a male connector.
    - **Applications:** Connecting components with different connector types, interfacing with components that have male pins.
- **Female-Female Jumper Wires:** These wires have female connectors (sockets) on both ends. They are used to connect two male connectors.
    - **Applications:** Connecting two components with male pins, extending connections.

102. PCB (Printed Circuit Board)

A PCB is a board that connects electronic components using conductive tracks. It provides mechanical support and electrical connections for the components. PCBs are used in almost all electronic devices.

- **Function:** PCBs provide a structured and organized way to connect electronic components. The conductive tracks on the board replace traditional wires, making circuits more compact and reliable.
- **Manufacturing:** PCBs are typically made by etching conductive material (usually copper) from a non-conductive substrate. The components are then soldered to the board, creating a complete circuit.
- **Types:** PCBs can be single-sided, double-sided, or multi-layered, depending on the complexity of the circuit.
- **Applications:** PCBs are used in almost all electronic devices, including computers, smartphones, televisions, and automobiles. They are essential for modern electronics manufacturing.