



Awareness Program on iT Technologies

Yuva AI for all

PCMB • PCMC • EBAC



Computer Architecture • Networks • Programming • Embedded Systems • Cyber Security • Robotics • AI



Course Overview

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Technology in Today's Life

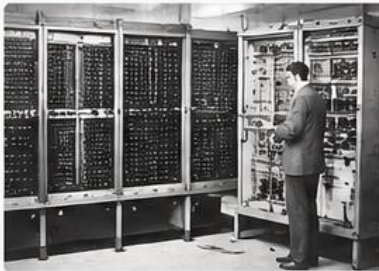
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Robotics & AI

COMPUTERS AND ITS GENERATIONS

• Evolution of Computers: Past to Present •

1ST GENERATION (1940–1956)



- Vacuum Tubes
- Very large in size
- High power consumption
- Generated a lot of heat
- Machine language

Examples: ENIAC, UNIVAC

2ND GENERATION (1956–1963)



- Transistors
- Smaller in size
- Less power consumption
- Less heat generation
- Assembly language

Examples: IBM 1401, PDP-8

3RD GENERATION (1964–1971)



- Integrated Circuits (ICs)
- More reliable
- Smaller size
- Operating Systems
- High-level languages

Examples: IBM System/360, PDP-11

4TH GENERATION (1971–2000)



- Microprocessors
- Very small in size
- High speed and efficiency
- Low power consumption
- User-friendly (GUI)

Examples: IBM PC, Apple Macintosh

5TH GENERATION (2000–PRESENT)



- ULSI Technology
- Artificial Intelligence
- Parallel Processing
- Natural Language Processing
- High performance & portability

Examples: Modern PCs, Laptops, Smartphones, AI Systems

TODAY'S COMPUTERS – POWERING THE DIGITAL WORLD



Laptops



Desktops



Tablets



Smartphones



Servers



Cloud Computing

THE FUTURE



Smarter • Faster • More Intelligent
Computers for a Better Tomorrow

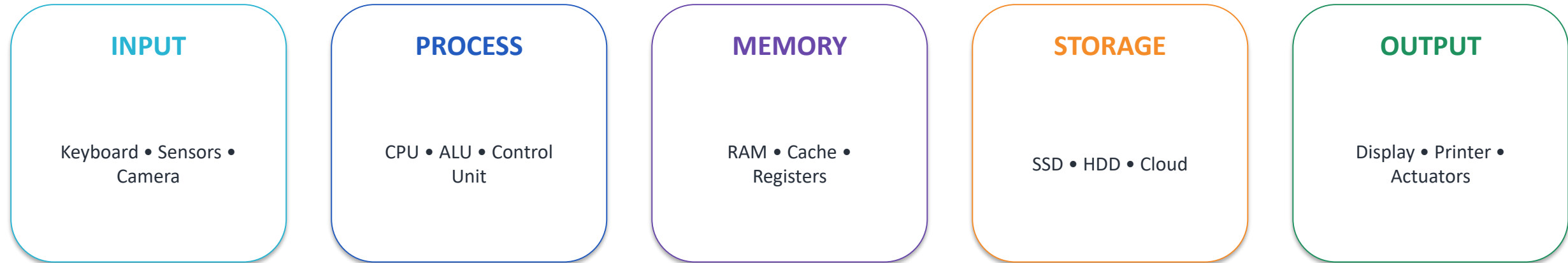


From huge machines to smart devices – **Computers** have transformed the world!

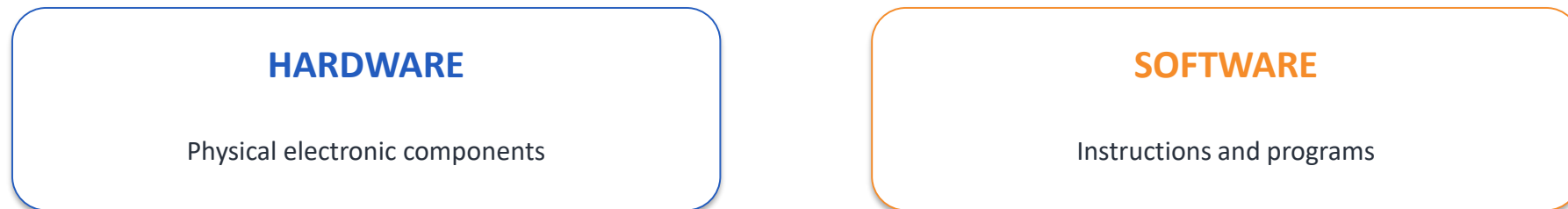


Past Innovation. Present Impact. Future Infinite.

Computer Architecture: How a System Works



Von Neumann concept: Instructions and data are stored and processed systematically.





OPERATING SYSTEM AND ITS TYPES



The Operating System is system software that manages computer hardware and software resources and provides common services for computer programs.

WHAT IS AN OPERATING SYSTEM?

An Operating System (OS) acts as an intermediary between the user and the computer hardware. It manages resources, controls programs, handles input/output operations and provides a user interface.



FUNCTIONS OF OPERATING SYSTEM



POPULAR OPERATING SYSTEMS



TYPES OF OPERATING SYSTEM

1. BATCH OPERATING SYSTEM



Jobs are collected in batches and executed without user interaction.

Example: IBM OS/360

2. TIME-SHARING OPERATING SYSTEM



Allows multiple users to share the system simultaneously.

Example: UNIX, Windows

3. MULTIPROGRAMMING OPERATING SYSTEM



Multiple programs are kept in memory and executed concurrently.

Example: OS/360, UNIX

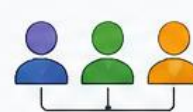
4. MULTITASKING OPERATING SYSTEM



Allows a single user to run multiple tasks or applications at once.

Example: Windows, macOS

5. MULTIUSER OPERATING SYSTEM



Supports multiple users working on the system at the same time.

Example: UNIX, Linux

6. REAL-TIME OPERATING SYSTEM



Designed to respond to events in real time, within strict time constraints.

Example: VxWorks, QNX

7. DISTRIBUTED OPERATING SYSTEM



Manages a group of independent computers and makes them appear as a single system.

Example: Amoeba, Plan 9

8. NETWORK OPERATING SYSTEM



Provides services over a network such as file sharing, user management, etc.

Example: Windows Server, NetWare, Linux

IN SIMPLE WORDS



The Operating System is like a manager that keeps everything in the computer **organized and working together.**



WHY ARE OPERATING SYSTEMS IMPORTANT?

- ✓ They make the computer easy to use.
- ✓ They manage resources efficiently.
- ✓ They provide a platform for running applications.
- ✓ They ensure security and data protection.



NETWORKING AND ITS TYPES

Networking is the connection of two or more devices to share data, resources and information.


Share Resources


Easy Communication


Data Sharing


Cost Effective



TYPES OF NETWORKS

1. PAN (Personal Area Network)



Connects personal devices within a very short range around a person.

Example: Bluetooth connection, wearable devices.

2. LAN (Local Area Network)



Connects devices within a limited area like home, office, school or building.

Example: Office Network, School Lab Network.

3. CAN (Campus Area Network)



Connects multiple LANs within a campus, university or organization.

Example: College Campus Network.

4. MAN (Metropolitan Area Network)



Covers a larger area like a city by connecting multiple LANs or CANs.

Example: Cable TV Network in a city.

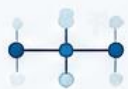
5. WAN (Wide Area Network)



Connects networks over very large areas like countries or continents.

Example: The Internet.

NETWORK TOPOLOGIES (Physical Layouts)



Bus



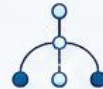
Star



Ring



Mesh



Tree

NETWORK DEVICES



Router



Switch



Modem



Access Point



Hub

 Internet Access

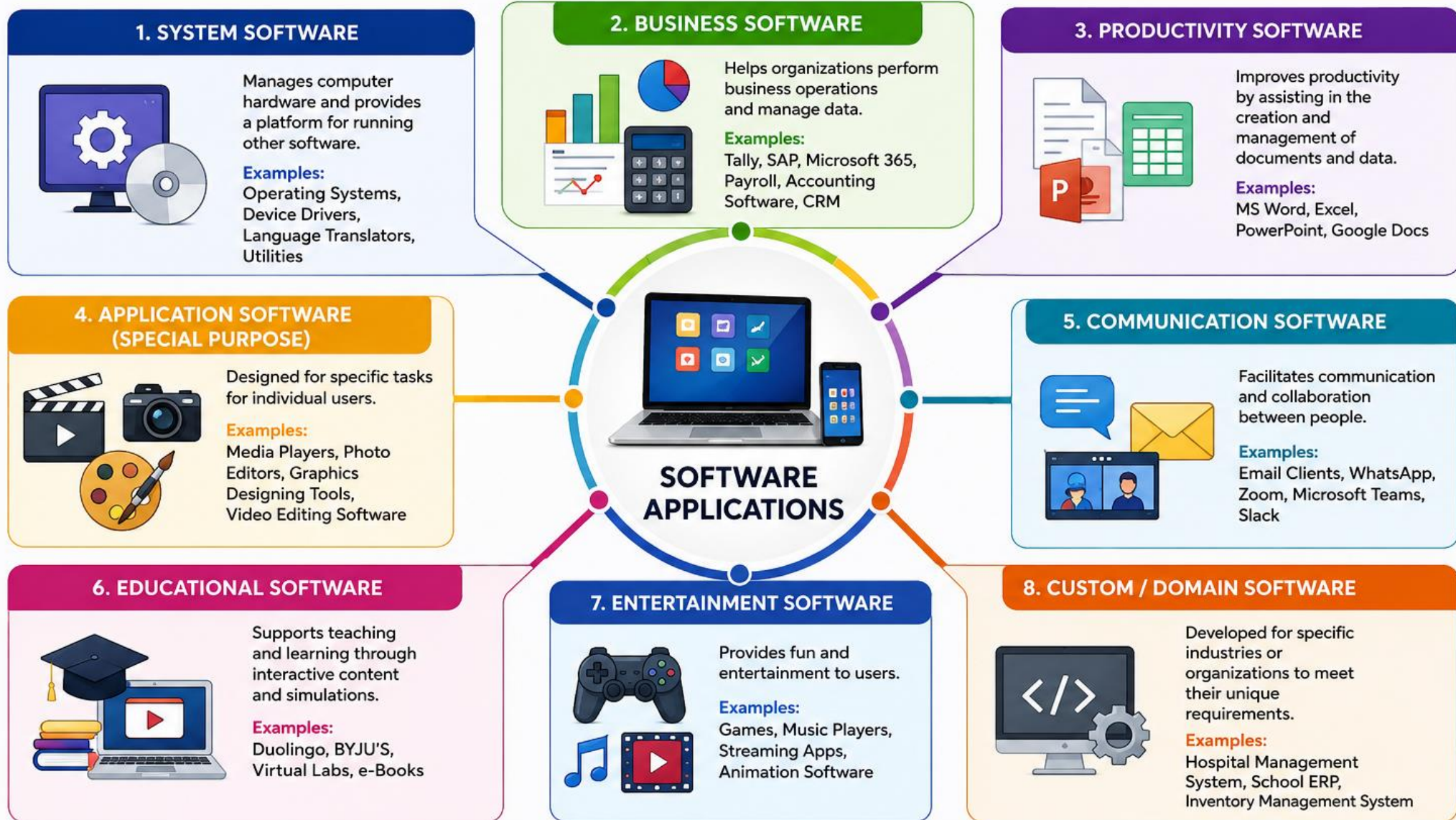
 File Sharing

 Printer Sharing

 Media Streaming

SOFTWARE APPLICATION TYPES

• Software applications are programs designed to help users perform specific tasks. •



In Short: System Software runs the system, Application Software runs the tasks, and Together they make work easier!



PROGRAMMING LANGUAGES



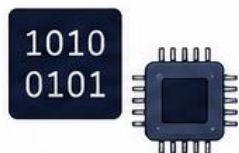
The Building Blocks of Software

Programming languages are used to write instructions that computers can understand and execute.

TYPES OF PROGRAMMING LANGUAGES

1. LOW-LEVEL LANGUAGES

Close to machine language.
Harder for humans to read and write.



Examples:

- Machine Language
- Assembly Language

2. HIGH-LEVEL LANGUAGES

Easy for humans to read and write. Independent of hardware.

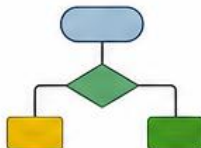


Examples:

- Python
- Java
- C, C++
- JavaScript

3. PROCEDURAL LANGUAGES

Focus on procedures or functions. Program is divided into functions.



Examples:

- C
- Pascal
- Fortran

4. OBJECT-ORIENTED LANGUAGES

Based on objects and classes.
Supports inheritance, encapsulation, polymorphism.



Examples:

- Java
- C++
- Python
- C#

5. SCRIPTING LANGUAGES

Interpreted at runtime.
Often used for web and automation.



Examples:

- JavaScript
- PHP
- Python
- Ruby

6. LOGIC LANGUAGES

Based on formal logic.
Used in AI and problem solving.



Examples:

- Prolog
- LISP

POPULAR PROGRAMMING LANGUAGES



Python

Easy to learn, versatile and powerful.



Java

Platform independent and widely used.



C

Fast and foundation of many languages.



C++

Extension of C with object-oriented features.



JavaScript

The language of the web.



C#

Used for Windows applications and games.



PHP

Used for web development on servers.



Swift

Used for iOS and macOS app development.



Go

Modern, fast and built for concurrency.

HOW PROGRAMMING LANGUAGES WORK?



1. You Write Code
(Using a programming language)



2. The Code is
Compiled or
Interpreted



3. Computer Understands
the Instructions



4. The Task is
Executed (Output)

WHY PROGRAMMING LANGUAGES ARE IMPORTANT?



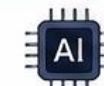
Build Websites,
Apps and Games



Automate
Tasks



Solve Complex
Problems



Power Artificial
Intelligence



Drive Innovation
and Technology

“ Every great software starts with a line of code.

Learn a language, build your future!



HARDWARE / EMBEDDED PROGRAMMING

Bridging Hardware and Software to build Smart Embedded Systems



WHAT IS EMBEDDED SYSTEM?

An embedded system is a combination of hardware and software designed for a specific function within a larger system. It is dedicated, real-time and often has constraints on size, power and cost.



EMBEDDED PROGRAMMING

Embedded programming involves writing code that controls hardware devices and performs specific tasks. It directly interacts with hardware resources like sensors, actuators, memory and I/O ports.

APPLICATIONS



Smart Home Devices



Automotive Systems



Medical Equipment



Industrial Automation



Consumer Electronics



IoT Devices



Wearable Devices



Aerospace & Defense

EMBEDDED SYSTEM ARCHITECTURE

INPUT DEVICES



PROCESSOR



Microcontroller / Microprocessor

MEMORY

RAM ROM EEPROM Flash

OUTPUT DEVICES



POPULAR EMBEDDED BOARDS

Arduino (UNO)



Easy to use, Open-source platform.

Raspberry Pi (Zero / 4)



Powerful single-board computer.

ESP32 Dev Board



Wi-Fi + Bluetooth for IoT applications.

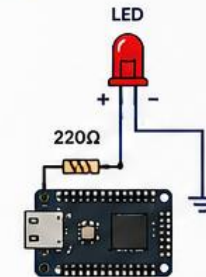
STM32 Nucleo Board



High performance ARM Cortex-M microcontrollers.

EXAMPLE: BLINK LED (ARDUINO)

```
1 // Blink LED
2 int led = 13;
3
4 void setup() {
5   pinMode(led, OUTPUT); // Set pin as output
6 }
7
8 void loop() {
9   digitalWrite(led, HIGH); // LED ON
10  delay(1000); // Wait 1 second
11  digitalWrite(led, LOW); // LED OFF
12  delay(1000); // Wait 1 second
13 }
```



TYPES OF EMBEDDED SYSTEMS



STANDALONE SYSTEMS

Operate independently and perform specific tasks.
Example: Washing Machine



REAL-TIME SYSTEMS

Respond to events within a strict time limit.
Example: Airbag System



NETWORKED SYSTEMS

Connected via networks for communication.
Example: Smart Thermostat



MOBILE SYSTEMS

Battery operated embedded systems with portability.
Example: Fitness Tracker

EMBEDDED PROGRAMMING WORKFLOW



1. REQUIREMENT ANALYSIS

Define the function and constraints.



2. HARDWARE SELECTION

Choose the right microcontroller & peripherals.



3. PROGRAMMING

Write code using Embedded C / C++ or MicroPython.



4. TESTING & DEBUGGING

Test, debug and optimize the performance.



5. DEPLOYMENT

Deploy the code into the hardware for real-world use.

COMMON TOOLS



Arduino IDE



PlatformIO



Keil uVision



STM32 CubeIDE



VS Code



gcc / GDB



Logic Analyzer



Oscilloscope



EMBEDDED SYSTEMS
Power the World. Code the Future.



Low Power Consumption



Real-time Performance



High Reliability & Efficiency



Compact Size & Cost Effective

TECHNOLOGY IN TODAY'S LIFE

Technology is not just a part of our lives—it makes life easier, faster, smarter and better.



1. COMMUNICATION



Stay connected instantly with anyone, anywhere in the world.

Examples:
Smartphones, Social Media, Video Calls, Messaging Apps

2. EDUCATION



Learn anytime, anywhere with access to endless knowledge.

Examples:
E-learning, Digital Classrooms, Online Courses

3. HEALTHCARE



Improves diagnosis, treatment and patient care with advanced technology.

Examples:
Telemedicine, Health Tracking, Robotics, Medical Apps

4. BUSINESS & WORK



Increases productivity, enables remote work and grows businesses.

Examples:
Automation, Cloud Computing, Online Meetings, E-commerce

TECHNOLOGY
CONNECTS,
EMPOWERS &
TRANSFORMS
OUR WORLD

5. ENTERTAINMENT



Brings fun, relaxation and entertainment right to our fingertips.

Examples:
Streaming Services, Online Gaming, Music Apps

6. TRANSPORTATION



Makes travel safer, faster and more convenient.

Examples:
GPS Navigation, Online Ticket Booking, Ride Sharing, Smart Traffic Systems

7. DAILY LIFE & CONVENIENCE



Simplifies everyday tasks and saves time and effort.

Examples:
Online Banking, Smart Home Devices, Digital Payments, E-Governance



Technology is changing the world every day and making it a better place to live.

Embrace Technology. Embrace a Better Tomorrow.



INTERNET SAFETY / CYBER SECURITY

Stay Safe Online. Protect Yourself. Secure Your Future.

WHAT IS CYBER SECURITY?



Cyber security is the practice of protecting systems, networks, and data from digital attacks, unauthorized access, damage or theft.

WHY IS IT IMPORTANT?



- Protects personal information
- Prevents financial loss
- Keeps systems and data safe
- Builds a secure digital world

COMMON ONLINE THREATS



Malware / Viruses

Malicious software that can damage your device or steal data.



Phishing Attacks

Fake emails or websites that trick you into sharing sensitive information.



Password Attacks

Hackers try to guess or steal weak passwords.



Identity Theft

Stealing personal information to impersonate you.



Ransomware

Locks your data and demands payment to unlock it.

SMART TIPS FOR A SAFE INTERNET

Use Strong Passwords

Use a mix of letters, numbers and symbols. Change them regularly.



Enable Two-Factor Authentication (2FA)

Adds an extra layer of security to your accounts.



Protect Your Personal Information

Don't share personal info like address, phone number, OTP, passwords.



Backup Your Data

Regularly backup important data to avoid loss in case of attack or system failure.



Think Before You Click

Don't click on links or download attachments from unknown senders.



Keep Your Software Updated

Updates fix security vulnerabilities and keep you protected.



Use Secure Networks

Avoid using public Wi-Fi for sensitive activities like banking or shopping.

SECURE YOUR DEVICES



Use Antivirus



Lock Your Device



Encrypt Your Data



Regular Backups



Strong PIN / Password

CYBER SECURITY IS A SHARED RESPONSIBILITY



Be Aware



Be Careful



Be Secure



Be a Part of a Safer Digital World

IF YOU ARE A VICTIM



Disconnect from internet



Report to authorities



Change your passwords



Inform your contacts



A Secure Today
A Better Tomorrow



CYBER SECURITY IS NOT JUST TECHNOLOGY,
IT'S A HABIT. **BE SAFE. STAY SECURE.**



Think
Before You Click



Protect
Your Data



Secure
Your Devices



Stay Informed
Stay Protected

9. Robotics

ROBOT COMPONENTS

Sensors — perception
Controller — decision making
Actuators — movement
Power — energy
Software — intelligence

ROBOT PROGRAMMING

Control loops
Sensor reading
Motor control
Path planning
Automation
Computer vision

APPLICATIONS

Manufacturing
Healthcare
Agriculture
Space
Drones
Service robots

10. Artificial Intelligence

MACHINE LEARNING

Systems learn patterns from data.

Examples:
Recommendations
Spam detection
Predictions

DEEP LEARNING

Neural networks learn complex patterns.

Examples:
Image recognition
Speech recognition

GENERATIVE AI

Creates new content.

Text • Images • Audio • Code
Requires responsible and ethical use.

Robotics + AI: Intelligent Automation



Applications: Autonomous vehicles • Smart factories • Medical robots • Precision agriculture • Intelligent assistants

Important: AI should be transparent, secure, fair and used under responsible human oversight.

"The best way
to predict the future
is to create it."
- Peter Drucker

ROBOTICS & ARTIFICIAL INTELLIGENCE



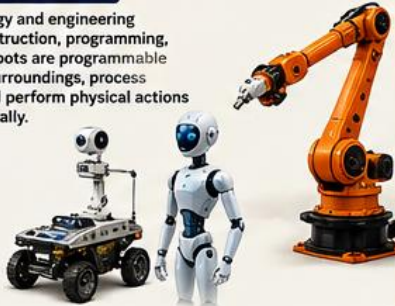
Building Intelligent Machines for a Smarter Tomorrow

1. WHAT IS ROBOTICS?

Robotics is a branch of technology and engineering concerned with the design, construction, programming, operation, and use of robots. Robots are programmable machines that can sense their surroundings, process information, make decisions and perform physical actions automatically or semi-automatically.

EXAMPLES

- Industrial robotic arms
- Surgical robots
- Drones
- Humanoid robots
- Agricultural robots
- Autonomous vacuum robots
- Space exploration robots



ROBOTICS

Deals with physical machines that sense, act and interact with the real world.

ARTIFICIAL INTELLIGENCE

Deals with intelligent systems that can learn, reason, perceive, understand and make decisions.

AI + ROBOTICS

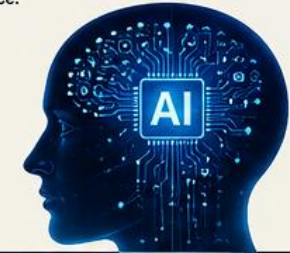
Intelligent Machines that Think, Learn and Act

2. WHAT IS ARTIFICIAL INTELLIGENCE?

Artificial Intelligence (AI) is a field of computer science that develops systems capable of performing tasks that normally require human intelligence.

AI TASKS INCLUDE

- ✓ Learning
- ✓ Reasoning
- ✓ Problem-solving
- ✓ Understanding language
- ✓ Recognizing images
- ✓ Making predictions
- ✓ Making decisions



COMPONENTS OF A ROBOT

1. SENSORS

Collect information from the environment.

- Camera
- Microphone
- Ultrasonic Sensor
- Touch Sensor
- Temperature Sensor
- LIDAR

2. CONTROLLER/PROCESSOR



Acts as the robot's "brain" and processes information.

3. ACTUATORS

Convert electrical energy into physical movement.

- Motors
- Hydraulic Systems
- Pneumatic Systems

4. POWER SUPPLY



Provides energy to operate the robot.

5. SOFTWARE



Controls how the robot behaves and performs tasks.

BASIC WORKING OF A ROBOT



Example: A robot detects an obstacle, processes the information, decides to change direction and moves accordingly.

3. MAJOR AREAS OF ARTIFICIAL INTELLIGENCE



MACHINE LEARNING

Allows computers to learn patterns from data and improve performance without being explicitly programmed.

Example: Email spam detection, recommendation systems



DEEP LEARNING

Uses artificial neural networks with many layers to solve complex problems.

Example: Image recognition, speech recognition, autonomous vehicles



NATURAL LANGUAGE PROCESSING (NLP)

Enables computers to understand, interpret and generate human language.

Example: Chatbots, translation, speech-to-text, virtual assistants



COMPUTER VISION

Allows machines to interpret and make decisions based on visual information.

Example: Face recognition, object detection, quality inspection

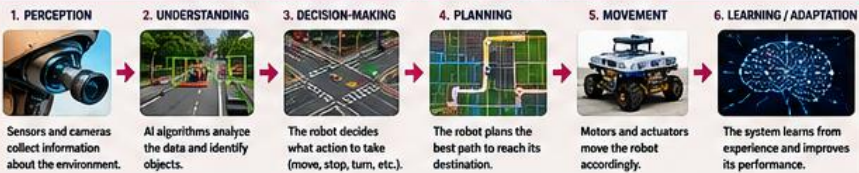
4. RELATIONSHIP BETWEEN ROBOTICS & AI

Robotics focuses on physical machines, while AI focuses on intelligence and decision-making. AI makes robots smarter, more adaptive and autonomous.

ROBOTICS	ARTIFICIAL INTELLIGENCE
Deals with physical machines	Deals with intelligent software/systems
Performs physical actions	Performs intelligent analysis and decision-making
Uses sensors and actuators	Uses algorithms and data
Can operate automatically	Can learn and reason from data
Example: Robotic Arm	Example: Speech Recognition System

AI can make robots perceive, learn, plan and adapt to real-world situations.

5. AI-POWERED ROBOTS: HOW THEY WORK



6. APPLICATIONS OF ROBOTICS & AI

HEALTHCARE	MANUFACTURING	AGRICULTURE	TRANSPORTATION	EDUCATION	SPACE EXPLORATION
Robot-assisted surgery, rehabilitation, patient monitoring, AI-based diagnosis.	Automation in assembly, welding, painting, packaging and quality control.	Crop monitoring, automated harvesting, drone spraying, soil analysis, yield prediction.	Autonomous vehicles, delivery robots, intelligent traffic systems, drones.	Educational robots, AI tutors, personalized learning, robotics labs.	Rovers explore planets, collect data and perform tasks in extreme environments.

7. ADVANTAGES

- ✓ High precision and accuracy
- ✓ Can work 24/7 without fatigue
- ✓ Can perform dangerous tasks
- ✓ Increases productivity
- ✓ Rapid data analysis and better decision-making
- ✓ Can handle repetitive tasks
- ✓ Improves safety
- ✓ Helps in solving complex real-world problems

8. LIMITATIONS & CHALLENGES

HIGH COST	JOB CHANGES	SAFETY	PRIVACY	BIAS	SECURITY	LACK OF HUMAN UNDERSTANDING
Expensive to develop, buy and maintain.	Automation reduces some jobs but creates new opportunities.	Robots must be designed carefully to avoid accidents.	AI systems using cameras and personal data can raise privacy concerns.	AI systems can produce unfair results if data is biased or incomplete.	Connected systems can be targets for cyberattacks.	AI does not understand the world like humans do.

9. THE FUTURE

The future will bring intelligent robots working alongside humans.

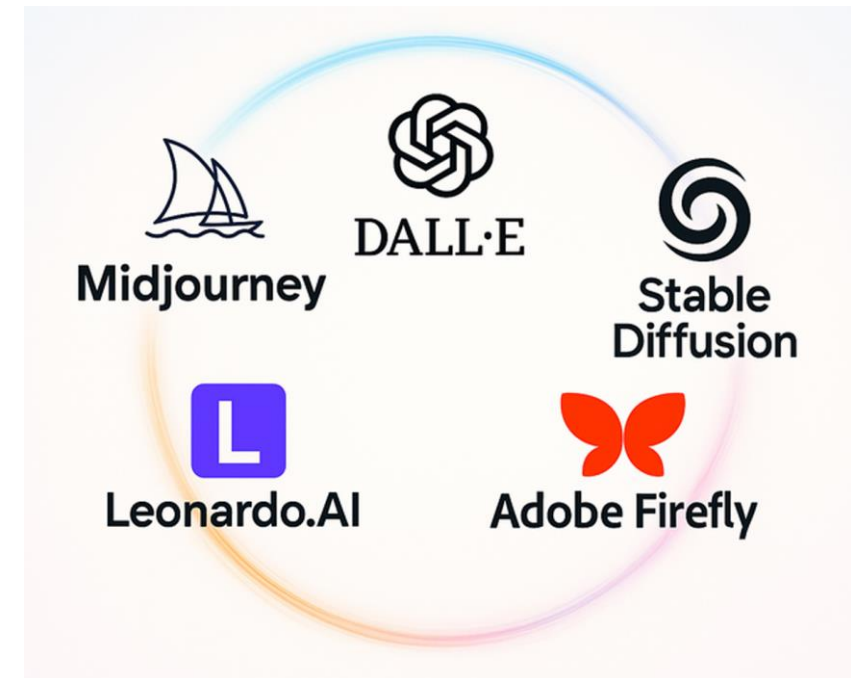
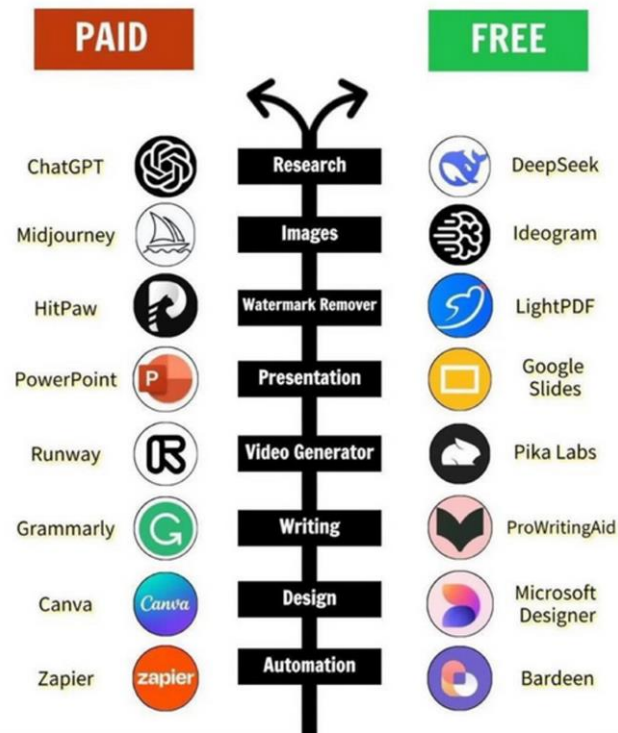
- ✓ Autonomous robots
- ✓ Humanoid robots
- ✓ AI-powered healthcare
- ✓ Smart factories
- ✓ Autonomous vehicles
- ✓ Agricultural robots
- ✓ Space exploration robots
- ✓ Assistive robots for all

AI GIVES
ROBOTS THE BRAIN.
ROBOTICS GIVES AI
THE ABILITY TO ACT.
TOGETHER, THEY BUILD
A BETTER FUTURE!



Types of Artificial Intelligence

- Narrow AI – Designed for a specific task, such as a chatbot or image recognition system.
- General AI – A theoretical AI capable of performing a wide range of human-like intellectual tasks.
- Reactive AI – Responds to current inputs without storing long-term experiences.
- Generative AI – Creates new content such as text, images, audio, video and code.



Career Pathways After II PU

Engineering

CSE • AI • Robotics • Electronics

Science

Data Science • Research • Bioinformatics

Commerce

FinTech • Business Analytics • Digital
Business

Skills

Coding • Cloud • Cyber Security • IoT

Higher Studies

BSc • BCA • BTech • Integrated Programs

Innovation

Startups • Research • Product Development

Build your future by combining subject knowledge with practical technology skills.

Technology with AI in Today's Life

Artificial Intelligence (AI) has become an important part of our daily lives. It helps people work faster, make better decisions, and solve problems more easily.

Some common uses of AI in everyday life include:

- 1. Smartphones:** AI powers voice assistants, face recognition, camera improvements, and predictive text.
- 2. Education:** AI can help students learn subjects, explain difficult topics, translate languages, and provide personalized practice.
- 3. Healthcare:** AI helps doctors analyze medical images, identify diseases, and support medical research.
- 4. Transportation:** Navigation apps use AI to suggest routes, predict traffic, and estimate travel times.
- 5. Entertainment:** Streaming platforms use AI to recommend movies, music, and videos based on our interests.
- 6. Shopping:** Online stores use AI to recommend products and provide personalized experiences.
- 7. Workplaces:** AI can help write documents, analyze data, automate repetitive tasks, and improve customer service.
- 8. Security:** AI is used for fraud detection, spam filtering, cybersecurity, and identity verification.
- 9. Space :** Spacecraft navigation, Planet exploration, Satellite monitoring, Space debris, Astronaut assistance
- 10. Wars and Military Operations :** Intelligence analysis, Surveillance, Cybersecurity, Logistics, Simulation & training
- 11. Police :** Crime analysis, CCTV analysis, Facial recognition, Emergency response, Traffic management, Missing-person investigations, Police training etc

KEY TAKEAWAYS

- ✓ Computing has evolved into intelligent, connected systems.
- ✓ Hardware and software work together to solve real problems.
- ✓ Operating systems and networks form the foundation of digital systems.
- ✓ Programming enables applications, automation and embedded devices.
- ✓ Cyber security is essential for protecting data and digital identities.
- ✓ Robotics combines hardware, sensors, control and programming.
- ✓ AI is transforming science, business, healthcare and daily life.

Thank You • Questions & Discussion