INTRODUCTION TO IT AND COMPUTERS

- Course overview
- Role of IT in society
- Basic computer terminology
- History of computing

Course overview

Provides students with knowledge of how computers work, how IT supports modern society and the basic components and operations of computer systems.

Course objectives

1. Understand the role of IT in society and organisation
2. Identify and describe components of a computer system.
3. Distinguish between hardware and software
4. Explain how computers process, store and retrieve data.
5. Understand number systems used in computing.
6. Use basic computer applications.
7. Apply IT concepts in data handling and statistical work.

Role of IT in society

1. Communication
2. Education
3. Business and commerce
4. Banking and Finance
5. Transportation
6. Government
7. Healthcare
8. Agriculture
9. Entertainment and Medial
10. Makes society more efficient informed, connected and productive.

Basic computer terminology

Data- Raw, unprocessed facts,

Hardware- physical, tangible parts of a computer eg keyboard.

Software- Instructions that tell the computer what to do.

Information- processed data that is meaningful and useful.

Input devices- devices used to enter data into a computer eg mouse.

Output devices- devices that display or produces results eg monitor

Computer system- A complete set of hardware, software, data and users that work together to perform tasks

CPU- brain of the computer.

Folder- A container used to organize files

File- A collection of related data stored under one name.

User- A person who operates or interacts with computer.

Peripheral devices- external devices connected to a computer eg keyboard.

Booting, process of starting a computer

Storage devices- used to store data permanently.

Memory- stores data and instructions temporarily or permanently.

Network- a group of connected computers that share resources

Internet- A global network that connects millions of computers around the world

Bit & Byte- Bit. smallest unit of data (0 or 1) Byte n. 8 bits

Operating system- System software that controls hardware and manages programs

History of computing

- Abacus was the first known calculating device as it used beads to perform addition and substraction.

- Napiers Bones: used rods marked with numbers to simplify division and multiplication.

Slide rule used for multiplication, division, roots and trigonometry, until 1970s

Pascaline by Blaise Pascal could add and subtract. First mechanical calculator

First generation (1940-1956)
Used vacuum tubes
Used machine language eg ENIAC

Second Generation (1956-1963)
Used transistors
Used assembly languages eg IBM 703

Third Generation (1964-1971)
Used Integrated Circuits
Users could multi program eg PDP-8

Fourth Generation (1971-present)
Uses microprocessors
Use high level languages eg laptops

FUNDAMENTALS OF COMPUTING OPERATIONS

- Understanding computer operations
- Input-process-output cycle
- Introduction to operating system

Understanding computer operations

- A computer performs tasks in a sequence of operations grouped into 4:-
  1. Input
- How a computer receives data from the outside world
- Process of feeding data or instructions into a computer.
  Devices used:- mouse, scanner, keyboard, camera, microphone
  2. Processing
  CPU does this part.
- It's the manipulation of data according to the instructions provided.
  3. Storage
- Computers need to store data temporarily or permanently
  - Primary storage
  - Secondary storage
  - Cache memory
  4. Output
- Process of presenting processed data.

Devices used:: Monitor, printer, speaker, projectors

Input-process-output cycle
Describes the basic flow of data through a computer system.
Steps of the IPO cycle
Input: Entering data or instructions into the computer.
Process: CPU calculates or manipulates data according to the instructions
Output: Presenting the processed data in a usable form.
Storage: saving data temporarily or permanently in memory.

Input → Process → Output → Storage

Introduction to operating system
OS is the main software that manages all the hardware and softwares resources of a computer.
Functions of Os
1. Managing hardware
2. Memory management
3. Managing software
4. User Interface
5. File management
6. Device management
Types of Os
1. Single user
2. Multi-user
3. Real time

4.Mobile Operating Systems.

COMPUTER HARDWARE BASICS

- CPU
- Memory
- Input/output devices
- Storage devices
- Practical identification exercises

Central Processing Unit (CPU)

- CPU is the brain of computer system.
- An electronic machinery that carries out instructions from programs that allows a computer or other device to perform its task.

Functions of the CPU

1. Controlling all other parts of the machine and sending timing signals.
2. Fetching data and instructions from memory.
3. Decoding instruction.
4. Performing arithmetical and logical operations.
5. Executing programs stored in memory.
6. Transferring data b/wn memory and I/o devices.

Parts of the CPU

1. ALU-Arithmatic logic Unit
2. CU - Control Unit
3. Register

Arithmatic Logic Unit (ALU)

It's responsible for mathematical, logical & decision operations.

Divided into two main parts:

a) Arithmatic portion-completes mathematical operations including addition, subtraction, multiplication and division.

b) Logic portion-completes operation comparing, selecting, matching & merging data and information.

2. Control Unit (CU)

It's the director of operations. It's where input is read & interpreted.

It sends data to the ALU, memory unit and other locations as needed.

It translates things into binary in order to store them and sends instructions to many different output devices.

It's the co-ordinator of all input and output devices.

Transfers data and instructions to other parts of the CPU

3. Register

It's a small and temporary storage containing a set of data holding places that are part of the computer processor.

It holds an instruction a storage address or any kind of data.

Memory

- Divided into two:-
  a) Primary storage memory
  b) Secondary storage memory

a) Primary Storage memory

1. RAM: Random Access Memory
   - Also called main memory, read-write memory or primary memory.
   - The programs and data that CPU requires during the execution of a program are stored in this memory.
   - Further classified into:-
     i) SRAM (Static Random Access Memory)
     ii) DRAM (Dynamic Random Access Memory)

2. ROM:- Read-Only Memory.
   - Stores crucial information essential to operate the system, like the program essential to boot the computer.
   - It's non-volatile
   - Always retains its data
   - Used in calculators and peripheral devices
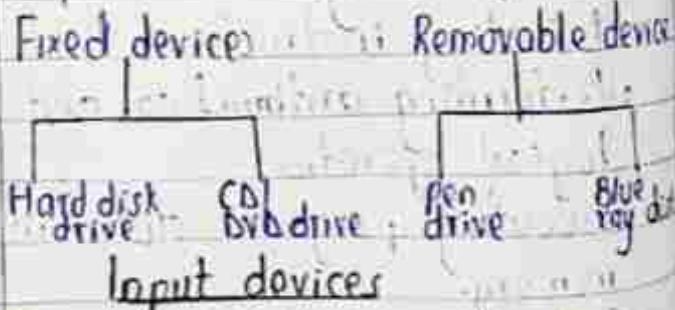   - Further classified into:-
     i) PROM
     ii) EPROM
     iii) EEPROM

Difference between RAM and ROM

RAM	ROM
Temporary storage	Permanent storage
Stores data in MB	Stores data in GB
Volatile	Non-volatile
Used in normal operations	Used for start-up process of computer
Writing data is faster	Writing data is slower

b) Secondary storage memory

known as backup memory or additional memory or auxilliary memory

Examples include:-
- Hard drive   Flash
- SSD   Optical drive
- USB drive

Secondary Memory
┌─────────┴─────────┐
Fixed devices   Removable devices
┌──┴──┐   ┌──┴──┐
Hard disk CD/DVD drive   Pen drive   Blue ray disk

Input devices

A computer device or hardware that allows the user to provide data input, instructions to the computer system.

They include:-
1. Keyboard
2. Mouse

3. Joystick
4. Scanner
5. Light Pen
6. Microphone
7. Digital camera
8. Track ball
9. Bar code Reader
10. Optical Character Reader

Output devices

- A hardware component of a computer system that displays information to users
They include:-
1. Monitor
2. Printer
3. Speakers
4. Projector
5. GPs
6. Plotter
7. Braille reader

Storage devices

- A hardware component which is used to store data and information either temporarily or permanently.
- They include:
1. RAM
2. ROM
3. CD
4. DVD
5. USB

COMPUTER SOFTWARE BASICS

- System software vs application software
- Operating systems
- Compiling systems.
- Hand-on demo of software installation.

Types of software

a) System software - provides the basic functions that are performed by the computer

b) Application software is used by the user to perform specific tasks.

System software

a) **Operating systems (Windows)**
- Schedules computer events
- Allocates computer resources
- Monitor events

b) **Language translators**
- Interpreters
- Compilers

c) **Utility programs (anti-virus)**
- Routine operations (eg sort, list, print)
- Manage data (eg create files, merge files)

Application softwares

- Programming languages
Assembly languages

System software

Purpose of system software are:
a) Provide basic functionality to the computer.
b) Control computer hardware
c) Act as an interference b/wn user application software & computer hardware.

Software comprises the entire of programs, procedures and routines associated with the operation a computer system

System software

It is designed to manage systems resources. It's a general purpose software.

Installed in the computer when the operating system is installed

Used for operating computer hardware

Works in the background hence user don't directly interact with them.

Examples:-
a) Operating system - governs and maintains the inter-cooperation of the components of a computer system eg microsoft windows, linux, mac os

b) Translators - Transform programming languages into

a form that can be interpreted compiled and executed by a computer

c) Device drivers-Act as inter-face b/wn the various input-output devices and the users or the operating system eg webcam installer, printer installer

d) BIOS- Basic Input Output System controls the peripheral or the input-output devices attached to the system.

e) Utility software-assists operating system to manage, organize maintain & optimize the functioning of the computer system eg anti-virus, file management tool, compression tool, back up utility etc.

Application software
- It runs as per user request.
- It's a specific purpose software
- Installed according to user's requirements
- Used by users to perform specific tasks.
- Used directly by users when launched and stops when closed.

Examples:-
1. General purpose apps-It's ready to use software eg

word processor- Ms word
Database software-Ms Access
Spreadsheet - Microsoft excel.
Presentation software-Ms powerpoint
Web browsers - google chrome
Multimedia software-Apple 1 movie

2. Specific Purpose Apps- developed and designed to fulfill certain business functions and to enhance accuracy, efficiency eg
- Ticket reservation system
- Hotel management system
- Payroll management system

System	Application
General purpose software	Specific purpose software
Low language is used	High language is used
Interacts with the hardware directly	Does not interact directly with the hardware.
Works in the background	Works in the fore front
Is a packaged program	Can be said to be resources, client serve

Operating systems
- It's an interface between user and computer
- A software which manages the hardware

Functions of OS

1. Provides an environment in which users and application software can work.
2. Manages different resources of the computer.
3. Controls the execution of different programs.
4. Provides a convenient interface to the user.

Types of Operating systems

1. Single user and single tasking
   - Used for a standalone single computer for performing a single task. eg MS-Dos
2. Single user and multi tasking
   - Allows execution of more than one task or process cocurrently
   - Processor time is divided among different tasks, switches rapidly b/wn processes. eg windows 10
3. Multiuser
   - Used in computer networks that allow some data & applications to be accessed by multiple users at the same time eg windows 7
4. Real time
   Respond to an event within a predetermined time.
   Used to control processes.

eg NYNX.
5. Embedded
   Embedded in a device in the ROM.
   Used in appliances like microwave
   Specific to a device and are less resource intensive.

Compiling systems

A set of programs that translate high-level programming language code into machine language (binary) that the computer's CPU can execute.

A compiler: A program that takes the entire source code as input, checks it for errors and translate it into machine code or executable file.

Compilation process

1. Lexical Analysis (Scanning)
   Reads source code character by character.
   Breaks it into tokens (keywords, identifiers, operators)
   Removes comments and uneccessary spaces.
2. Syntax analysis (Parsing)
   Checks if the tokens follows the rules of the programming language
   Builds a syntax tree.

3 Semantic Analysis
Checks meanings
Ensures variables declared
Verifies type compatibility
4 Intermediate code Generation
- Converts code into a low level
  platform-independent form.
- Makes optimization easier
5 Code optimization
- Tries to improve performance
- Removes unecessary instruction
- Makes code faster & smaller.
6 Code Generation
- Produces final machine code
- Creates an executable file.
7 Error handling
- Detects errors at all stages
- Generates error messages
  with line numbers.
Linking and loading
After compilation, linker
combines your program with
Library files
Loader loads the program
into memory for execution
Advantages of compiling
systems
1 Faster program execution
2 Allows code optimization
3 Ensure program is secure
  before running
4 Good error detection.

Produces independent executable files
Uses of compiling systems
Game development
Data analysis tools
Operating systems development
Building applications
Mobile apps
Embedded systems

DATA & DATA FILES

- Concept of data - bit, byte, data types, constructing random & sequential data files.
- Define - bit & byte.
- Describe different file organization methods.
- File types, data types, units of data.

Data is raw, unprocessed facts that have no meaning on their own.

Information is processed data.

Difference between data and information

Data	Information
1. Unprocessed raw facts	Processed form of data
2. Used as input of computer	Output of a computer
3. Not meaningful	Meaningful
4. Huge in its volume	Short in volume
5. Used rarely	Used frequently
6. An independent entity	Depends on data.
7. Not used in decision making	Very important for decision making.

Types of data

1. Based on Nature
   - Qualitative data - gender
   - Quantitative data - age
2. Based on source
   - Primary data - surveys
   - Secondary data - books.
3. Based on processing
   - Raw data
   - Processed data
4. Based on Time
   - Cross-sectional data - one point in time
   - Time-series data - over a period of time
5. Based on Measurement scale
   - Nominal - Labels without order
   - Ordinal - Ordered categories
   - Interval -
   - Ratio - weight

Bit and bytes

Bit	Byte
Smallest unit of data	Collection of 8 bit. It's quite greater.
Represented either in form of 0 or 1	Represented in 256 different types
Represented by symbol `b`	Represented by symbol `B` in upper case
It's of different sizes; kb, Mb, Gb, Tb	Different sizes; kB, MB, GB, TB
Example - used in Radio, Data speed	Example - used in data files, movies, images

Units of data

Unit	Size
Bit	smallest unit (0 1)
Byte	8 bits
kilobyte	1024 bytes
Megabyte	1024 kB
Gigabyte	1024 MB

File types
- Format in which data is stored on a computer

Categories of file types
1. Document files
2. Audio files
3. Video files
4. Image files
5. Compressed file
6. System files

File Organisation Methods
1. Sequential File Organisation
- Records are stored one after another in a fixed order
eg Payroll systems
       Attendance registers

2. Indexed File Organisation
- Multiple indexes are used to access records by different fields. eg Search engines
          Airline booking system

3. Random File Organisation
- Records are stored in no particular order, but on address is calculated using a hash

function eg Inventory control)

4. Indexed sequential File Organisation
- Combines sequential & index methods
eg Library systems
     National ID databases.