A/L ICT | Lesson 1: ICT concepts

1. Data, Information & Technology

Data, Information, Knowledge

- **Data:** Raw, unorganized facts. *(e.g., 19, 25, 22)*.
- **Information:** Processed, meaningful data. *(e.g., "The average temperature is 22°C")*.
- *Note: One system's Information can be another's Data.*
- **Data Types:**
  - **Quantitative:** Numerical, measurable. *(e.g., Marks)*.
  - **Qualitative:** Descriptive, non-numerical. *(e.g., Goodwill)*.
- **Data Life Cycle:** Creation → Management → Removal.

Value of Information

- **Characteristics:** Accurate, Complete, Timely, Relevant, Understandable.
- **Golden Rule:** Value is highest at creation, decreases over time.
- **Big Data:** Extremely large data sets requiring advanced tools for analysis.

Need for Technology

- **Manual Processing Drawbacks:** Slow, error-prone, inconsistent data, poor sharing.
- **Internet:** Global "network of networks". Uses `TCP/IP` protocol.
  - **Services:** WWW, Email, FTP, Telnet, VoIP, etc.
- **Mobile Tech:**
  - **Communication:** Wireless data/voice transmission.
  - **Computing:** Using devices without a fixed physical link.
- **Cloud Computing:** Online access to shared computing resources.
  - **IaaS:** Rent infrastructure. *(Land & Bricks)*.
  - **PaaS:** Rent a platform. *(Workshop)*.
  - **SaaS:** Rent software. *(Finished Product)*.

2. The Computer System

System Definition

An interrelated set of components working together to achieve a common objective. **Model:** Input → Process → Output.

System Components

- **Hardware:** Physical parts. (Input, Output, CPU, Memory).
- **Software:** Instructions. (System, Application).
- **Firmware:** Software embedded in hardware. *(e.g., BIOS)*.
- **Liveware:** The human user.

Hardware Details

- **Processing:** CPU (main brain), GPU (graphics brain).
- **Memory Hierarchy:**
  - **Cache:** CPU's ultra-fast notepad.
  - **RAM (Primary):** Temp workspace, **Volatile**.
  - **Secondary:** Permanent storage, **Non-volatile**.
- **Networking:** NIC, Switch, Router, Gateway, Bridge.

Software Details

- **System Software:** Manages the computer.
  - **Operating System (OS):** e.g., Windows, Linux.
  - **Utilities:** e.g., Antivirus, Disk Tools.
  - **Language Translators:** Compiler, Interpreter.
- **Application Software:** User-task oriented. *(e.g., Word)*.
- **Software Licensing:**
  - **Proprietary:** Secret recipe. Limited rights.
  - **FOSS (Open Source):** Public recipe. Free to use, modify, share.

3. Data Processing In Action

Data Processing Cycle

Gathering → Validation → Processing → Output → Storage

Gathering & Input

- **Manual Methods:** Interviews, Questionnaires, Observation.
- **Automated Tools:**
  - **OMR:** Reads pencil marks. *(MCQ Sheets)*.
  - **OCR:** Converts image text to editable text.
  - **MICR:** Reads magnetic ink. *(Bank Cheques)*.
  - **Other:** Barcode Readers, RFID, Sensors.
- **Input Modes:**
  - **Online:** Data entered as transaction happens.
  - **Offline:** Data collected, entered later in a batch.

Validation (Data Quality Check)

- **Range Check:** Is value within limits? (e.g., 0-100).
- **Presence Check:** Is required field empty?
- **Type Check:** Is it the correct data type (number/text)?

Processing, Output & Storage

- **Processing Modes:**
  - **Batch:** Collect all data, process in one go. *(e.g., Payroll)*.
  - **Real-time:** Instant processing. *(e.g., ATM transaction)*.
- **Output Methods:**
  - Direct presentation (Monitor, Printer).
  - Storing for further processing.
- **Storage Methods:**
  - **Local/Remote:** On-site vs. Cloud.
  - **Short/Long-term:** RAM vs. Hard Drive.

4. ICT's Role & Impact on Society

Applications of ICT

- **Education:** E-learning, CBE (Computer-Based Ed.).
- **Healthcare:** Diagnostics (ECG, CT), Patient records.
- **Agriculture:** Greenhouse control, RFID for livestock.
- **Business/Finance:** Banking (ATM), Payroll, Stock Mgt.
- **Engineering:** CAD (Design), CAM (Manufacturing).
- **Media:** Digital content creation, Global news access.
- **Law Enforcement:** CCTV analysis, GPS tracking.

Societal Impact

- **Benefits:** Economic growth, Global connectivity, Improved efficiency, Access to information.
- **Issues:**
  - **Digital Divide:** "Haves" vs. "Have-nots" of tech access.
  - **E-waste:** Discarded electronics. Solution: **Green Computing** (eco-friendly ICT use & disposal).

Ethical & Legal Issues (The "Don'ts")

- **Confidentiality:** Keep data secret. Use passwords, encryption.
- **Privacy:** Right to control one's personal information.
- **Intellectual Property:** Legal ownership of creations.
  - **Copyright:** Protects original works (books, music, code).
  - **Piracy:** Illegal copying/distribution of copyrighted material.
  - **Plagiarism:** Using someone's work as your own.
- **Security Threats:**
  - **Phishing:** Fake login pages to steal credentials.
- **Netiquette:** "Network Etiquette". Good manners online.