Input and Output devices

1)keyboards

- **Keyboard:** An input device containing keys, arranged in a typewriter configuration, used to input letters, numbers, and other symbols. Can be wired or wireless.
  - Most PCs today are designed to be used with a keyboard

- Contains

  - Standard alphanumeric keys
  - Numeric keypad
  - Function keys
  - Directional keys and special keys
- Keyboards are increasingly including alternate input tools
  - Touch pads
  - Scroll wheels
  - Some also include built-in display screens
- Portable PCs and mobile devices often use:
  - Thumb pad
  - Slide-out keyboard
  - Pen or touch input
  - Portable keyboard
  - Virtual keyboard is an emerging possibility

2)Pointing Devices

- **Pointing device:** An input device that moves an onscreen pointer (arrow or insertion point) to allow the user to select objects on the screen
  - Usually buttons on the device are used to select objects
- Common types of pointing devices:
  - Mouse, Electronic pen, Touch screen, Joysticks, gamepads, and other gaming devices.
  - Trackballs
  - Control buttons and wheels, Touch pads

a) Mouse

- **Mouse**: A pointing device the user slides along a flat surface to move a pointer around the screen and clicks its buttons to make selections.
  - Older mechanical mice use a ball
  - Newer optical or laser mice track movements with light
  - Can be wireless

b) Electronic pen

- **Electronic pen**: Device used to select objects, as well as to draw or write electronically on the screen. Also called tablet pen, digital pen, stylus.
- Commonly used with pen-based PCs
  - Used to issue commands and input data
  - If handwriting recognition is used, written text can be converted to editable typed text
  - Also used with Digital writing systems, Graphics tablets and Signature capture devices

c) Touch screens

- **Touch screen**: Display device that is touched with the finger to issue commands or otherwise generate input to the connected PC
- Used with:

  - Desktop and portable PCs
  - Mobile phones and mobile devices
  - Interactive whiteboards
  - Consumer kiosks

3) Scanners

- **Source documents**: Documents containing data that already exists in physical form (order form, photograph, invoice, check, or price label)
- **Source data automation**: Capturing data directly from a source document
  - Saves time
  - Increases accuracy

- Scanner (optical scanner): Input device that reads printed text and graphics and transfers them to a computer in digital form
  - Can scan photos, documents, drawings, (flat objects)
  - Data is typically input as a single image
  - If optical character recognition (OCR) is used, text is input as editable, typed text
- Types of scanners: Flatbed, Drum, Handheld, 3D.

- Optical resolution: Quality of scanned images

  - Measured in number of dots per inch (dpi)
  - Can often be specified when image is scanned
  - Can be changed when scanned image is edited
  - Varies with scanner used
- Pixel: Smallest colorable area in an electronic image.

4)Readers

- Barcode readers: Input devices that read barcodes
- ❖ Barcode: Machine-readable code that represents data as a set of bars
- ❖ Common types
  - Universal Product Code (UPC), ISBN, Code 39, POSTNET code, High-capacity color barcode (HCCB)
- Radio frequency identification (RFID): Technology used to store and transmit data in RFID tags
- ❖ RFID tag: Contains tiny chips and radio antennas, Read by RFID readers.
  - Attached to objects for identification purposes
  - Tags only need to be within range of the reader, rather than in the line of sight
- ❖ Applications:
  - Tracking inventory and assets
  - Electronic tolls
  - Electronic payments (Near Field Communication)
  - Security

- ➕ <mark>Optical Mark Readers</mark> (OMRs): Input data from special forms to score or tally exams, questionnaires, ballots.
- ➕ <mark>Optical Character Recognition Devices</mark>(OCR): Reads optical characters that are designed to be identifiable by humans as well as OCR devices
  - Most machines today are designed to read several standard OCR fonts
  - Used to process turnaround documents like monthly bills
- ➕ <mark>Magnetic ink character recognition</mark> (MICR) readers: Read MICR characters
  - Used primarily for banking
  - MICR readers read the special magnetic characters and sort/process checks
- ➕ <mark>Biometric readers</mark>: Used to input biometric data
  - Can be stand-alone or built into another piece of hardware (keyboard, mouse)
  - Also being built into computers and storage devices to allow access only by authorized individuals
  - Most often used for access control and to verify transactions
- ➕ <mark>Biometric data</mark>: Based on unique physiological characteristics or personal trait
  - Fingerprint
  - Hand or face geometry
  - Iris of the eye
  - Voice or signature

5)Digital Cameras

- ➕ <mark>Digital cameras</mark>: Record images on digital storage medium rather than film
  - Can either be still cameras or video cameras
  - Typically use flash memory for storage
  - Images can be edited, posted to a Web page, burned to a CD or DVD disc, etc.
- ❖ <mark>Digital still cameras</mark>
  - Available in a wide variety of sizes and capabilities
  - Photos can be transferred to a PC or printer
  - Camera quality is measured in megapixels

❖ **Digital video cameras**
- Digital camcorders
- PC video cameras (PC cams, Web cam)

6)Audio Input and Output

- **Audio input**: The process of entering audio data into the computer
  - Voice (narrations, podcasts, etc.)
  - Music (from CDs, MIDI keyboards, etc.)
- **Voice input systems** (speech recognition systems)
  - Enable a computer to recognize the human voice
  - Consist of a microphone or headset and appropriate software
  - Can be used to dictate text or commands into a PC
- **Audio output**: Output in the form of voice or music
  - Speakers
  - Voice output systems
  - Headphones and headsets
  - Earphones and earbuds

7)Display Devices

- **Display device**: Presents output visually
  - Monitor: Display device for a desktop PC
  - Display screen: Screen built into a variety of devices
    - Notebook and handheld PCs,
    - Mobile phones and mobile devices
    - E-books readers, digital photo frames, and other consumer devices, and many other devices
    - Digital signage systems
    - E-paper
- **Flat-Panel Display Technologies**
- ❖ Liquid crystal displays (LCDs): Use charged liquid crystals between sheets of glass or plastic which requires backlighting
- ❖ LED (Light emitting diode): Used in displays as well as a variety of consumer products

- ❖ <mark>Organic light emitting diode</mark> (OLED) displays: Use emissive organic material to display brighter and sharper images
  - Do not need backlighting
  - Used with consumer devices (portable digital, media players, TVs, etc.)
  - Special types of OLEDs:
    - o Flexible OLEDs (FOLEDs)
    - o Transparent OLEDs (TOLEDs
    - o Phosphorescent OLEDs (PHOLEDs)
- ❖ <mark>Interferometric Modulator Displays</mark> (IMOD): Essentially a complex mirror that uses external light to display images
  - Designed initially for mobile phones and portable devices
  - Images are bright and clear, even in sunlight
- ❖ <mark>Plasma displays</mark>: Use layers of gas to display images
  - Most often used on large displays
- ❖ <mark>Data projector</mark>: Display device that projects all computer output to a wall or projection screen
  - Most data projectors today can project video, in addition to computer output
  - Can be wireless or integrated into devices
  - Fog Screen systems projects on a thin layer of fog
  - Holographic projectors are in development

8)Printers

- ✚ <mark>Printers</mark>: Produce hard copy
- ✚ Printer Characteristics
  - Printing technology used: Impact vs. nonimpact
  - Color vs. black and white
  - Personal vs. network printers
  - Print resolution
  - Print speed
  - Possible connections
  - Multifunction capabilities

- ❖ <mark>Laser printer</mark>: Uses toner powder and technology similar to that of a photocopier to produce images on paper
  - The standard for business documents
  - Print one entire page at a time
  - Generally faster and have better quality than ink-jet printers
  - Can be black and white or color
  - Common print resolution is between 600 and 2,400 dpi
  - Use toner cartridges
- ❖ <mark>Ink-jet printer</mark>: Sprays droplets of ink to produce images on paper
  - Usually print in color
  - Often the choice for home use
  - Print fairly slowly, one line at a time
  - Quality not quite as good as a laser printer
  - Use ink-jet cartridges
- ❖ Newer printers with full width printheads are much faster
  - Potential applications for the future
    - o Dispensing liquid metal, aromas, computer chips and other circuitry, "printing" human tissue
- ❖ <mark>Special-Purpose Printers</mark>
  - Photo printers
  - Barcode, label, and postage printers
  - Portable printers
  - Plotters and wide-format ink-jet printers
  - 3-D printers