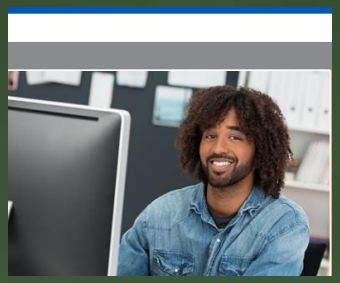
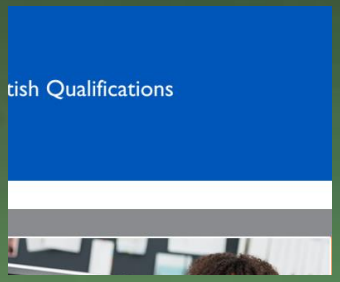
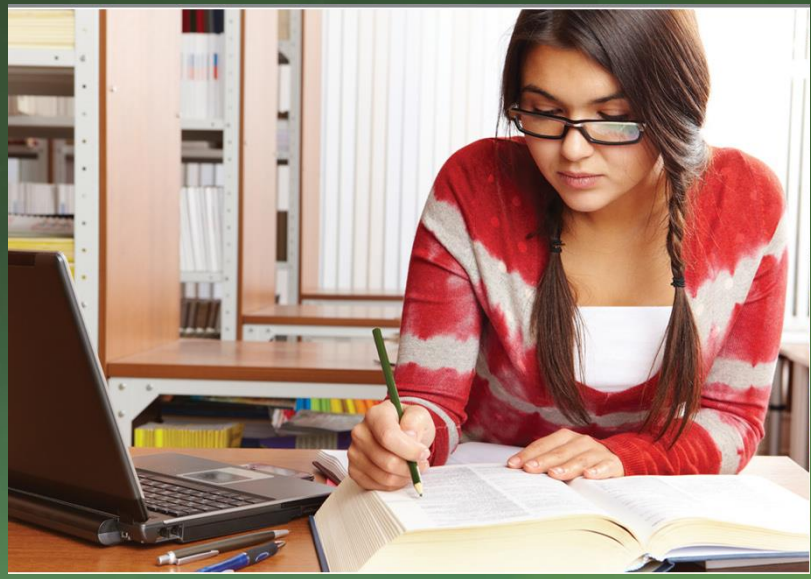
Awarding Great British Qualifications







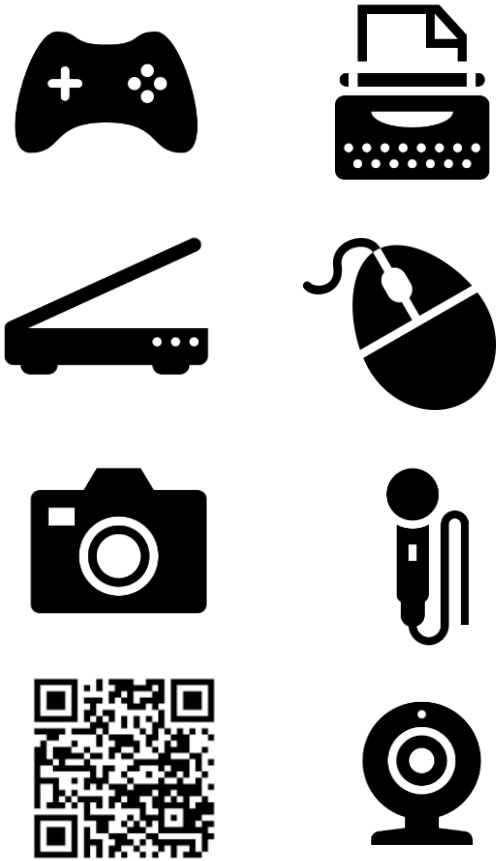
Computer Systems

Topic 4: Peripherals and System Building

Scope and Coverage (A)

This topic will cover:

- **INPUT** Peripherals
  - Keyboard/keypad (wired & wireless)
  - Mice/Mouse (wired & wireless)
  - Joysticks/Gaming controllers
  - Touchscreens
  - Scanners/Cameras/Webcams
  - Microphones/voice recognition
  - Sensors/Barcodes/RFID/Q Codes

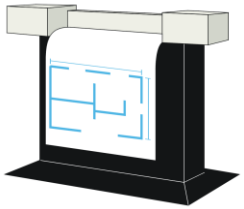


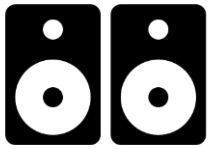
Scope and Coverage (B)

This topic will cover:

- **OUTPUT** Peripherals
- Printers/plotters (2-D and 3-D)
- Computer monitors/screens
- Television screens
- Speakers & Headphones
- Data Projectors





Scope and Coverage (C)

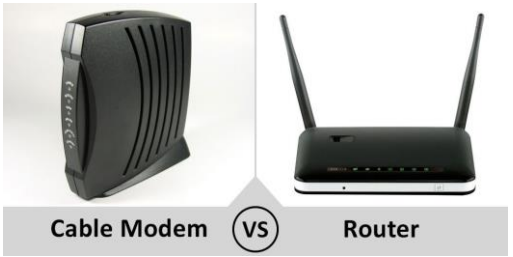
This topic will cover:

- **STORAGE** Peripherals
  - Floppy Disks
  - USB pen/flash drives
  - External hard drives
  - External CD/DVD drives
  - Tape drives

Scope and Coverage (D)

This topic will cover:

- **COMMUNICATION** Peripherals
  - Wireless routers
  - Cable Modem
  - USB Bluetooth dongles



Learning Outcomes

By the end of this topic students will be able to:

- Explain the hardware, software and peripheral components of a computer system
- Build and configure a computer system to meet a design specification

Peripherals Essentials

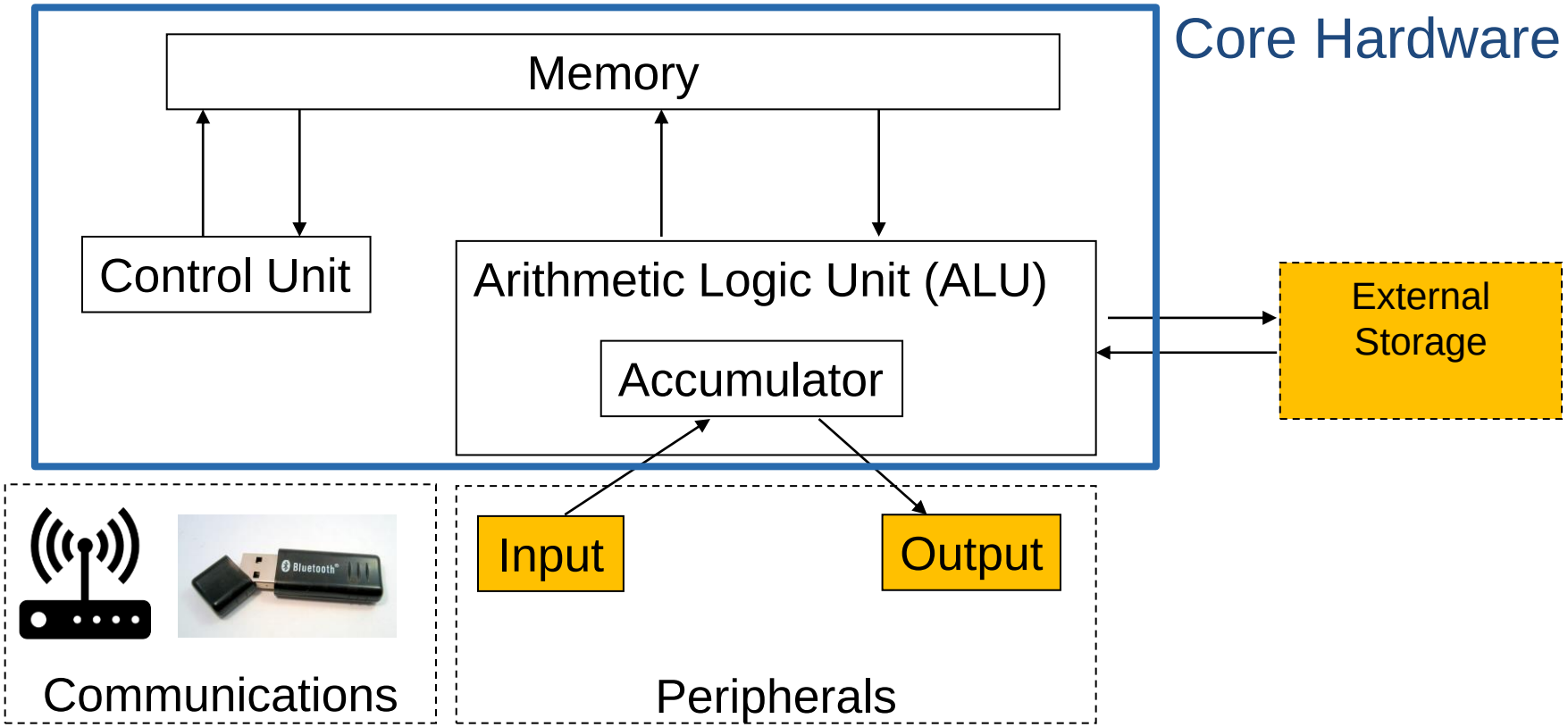
- A *peripheral* is any device that is **attached** to a computer system (as opposed to being part of it)
- Physically & logically separate from the computer – but still partially or wholly dependant on the computer
- *But not always* – for example, some printers may allow printing of photographs direct from memory cards *without a PC being attached.*
- See the '**PictBridge**' standard
- http://whatis.techtarget.com/definition/PictBridge

Peripherals Essentials

- Provides additional facilities to the computer
- Does not form part of the CPU or core hardware
- Provides:
  - **Input** functions
  - **Output** functions
  - Additional **storage** functions
  - **Communications** capabilities

See the diagram on next slide…

Von Neumann Architecture & Peripherals



INPUT Peripherals

Input Devices

- Take data from the real-world:
  - Data (digital or analogue)
  - Images/Video
  - Sound
- Puts it into the computer system
- Many types of input device depending on use:
  - A few are generic
  - Many are specialised

Keyboard

- Update of original typewriter – invented in late 1800s
- Also related to the Telex machine and games console
- Good for entering small quantities of textual data
- Not good for very large quantities of data – too slow
- Not good for non-textual data (graphics or sound)
- Usual layout is called ***QWERTY keyboard***
- *There are many alternative formats and layouts*
- *A 'key-press' generates an electronic code to operating system, converted to Unicode characters*

Keyboard

- **QWERTY**
  - Designed to *deliberately* slow down typists when mechanical typewriters got jammed!
  - Not very ergonomic:
    - Hands are at the wrong angle
    - Keys are grouped to slow you down
  - Still used because of retraining costs
  - Alternatives: Dvorak or alphabetical
  - What do they do in China or Japan?
  - https://en.wikipedia.org/wiki/Keyboard_layout

Alternative Keyboards

- See these excellent videos on layouts:
  - https://www.youtube.com/watch?v=s8S5DJQJOeM
  - https://www.youtube.com/watch?v=tIJNusYZXMA

- Other issues include ‘overlay’ keyboards:
  - http://overlaykeyboard.com/
  - Programmable areas with overlay sheet
  - Used on tills (Fast Food)
  - Used for disabled (see later)
  - Used where there may be language problems

Mouse

- A ‘pointing’ device that captures 2-D spatial movement across a surface
- Originally electro-mechanical, now optical
- Can be wired or wireless
- Multiple styles and features
- Invented by **Douglas Engelbart** in1963
  - American working at Stanford
  - Never got any money from his invention
  - Patent ran out before mice became used

http://www.computinghistory.org.uk/det/613/the-history-of-the-computer-mouse/
https://www.computerhope.com/issues/ch001083.htm

Mouse

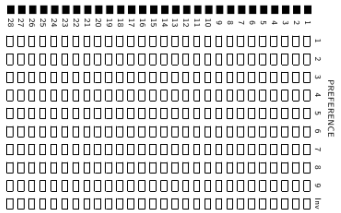
- Now many different designs and alternatives:
  - **Tracker ball** is an ‘upside-down’ mouse
    - https://www.computerhope.com/jargon/t/trackbal.htm
  - **Trackpad/touchpad** on laptops
    - https://www.computerhope.com/jargon/t/touchpad.htm
  - **Joysticks** on games consoles
    - https://www.computerhope.com/jargon/j/joystick.htm

Digital Camera/Webcam

- Incorporates a **CCD** (Charge-Coupled Device) or **CMOS** sensor/chip that detects light (photons) and translates them into digital values (electronic signals)
  - http://electronics.howstuffworks.com/cameras-photography/digital/question362.htm
  - http://electronics.howstuffworks.com/cameras-photography/digital/digital-camera.htm
- The camera is not directly attached to the computer:
  - Used off-line (as DSLR camera or in Smartphone)
  - Photos stored on flash memory cards
  - Images transferred to computer either by connecting camera (USB or Firewire) or using a separate memory card reader (which is itself a peripheral)

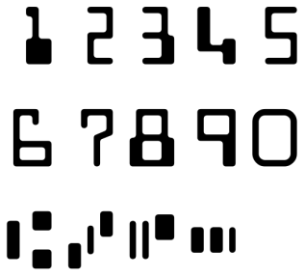
Scanner

- A variation on digital camera technology
- Uses reflected light (photons) to translate documents into computer data (electrons)
- Scanning technology appears in various forms:
  - Barcode reader (holding product information)
  - Q-Code reader (holding various types of encoded data)
  - Optical mark reader (multiple-choice exams)
  - Flatbed scanner (document pages and photos)

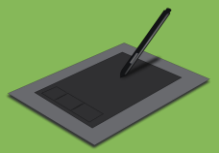


Scanner

- Some use *magnetic* information rather than light:
  - **Magnetic card reader**
    - Credit/Debit cards (although ‘Chip & PIN’ now taken over)
    - https://www.computerhope.com/jargon/m/magcr.htm
    - http://money.howstuffworks.com/personal-finance/debt-management/chip-and-pin-credit-cards.htm
  - **Magnetic Ink Character Recognition (MICR)**
    - Used on cheques and other banking documents
    - https://www.computerhope.com/jargon/m/micr.htm



Graphics Tablet



- Flat working area with stylus connected to computer (hence ‘tablet’)
- Used like pencil & paper to draw (hence ‘graphics’)
- Good for freehand drawing and picture editing
- Interactive whiteboard is a variation on this

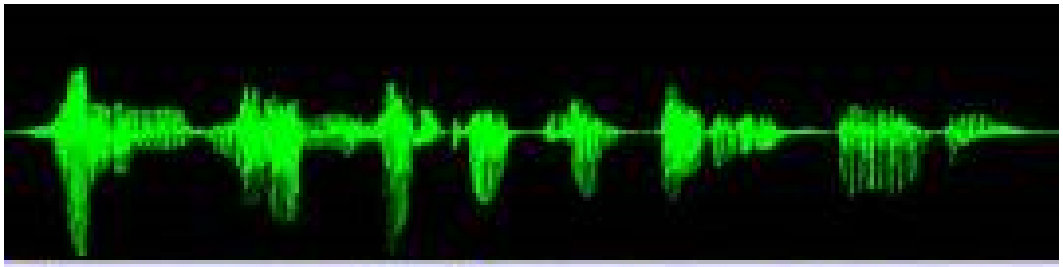
https://www.techwalla.com/articles/how-does-a-graphic-tablet-work

Touch Screen

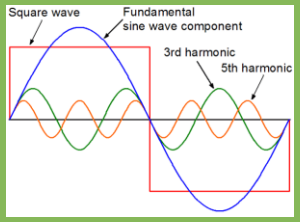
- Effectively a monitor and a graphics tablet combined
- Displays computer images (like normal screen/monitor)
- Has a touch sensor (to capture surface contact)
- Works with a stylus or human finger
- Used on:
  - Smartphones (such as Apple iPhone)
  - Tablet PCs and iPad
  - Some public information screens/systems

Microphone

- Can be used by able-bodied users for efficiency
  - Voice-recognition technology
  - Allows dictation rather than typing
  - Great for entering large amounts of text
- Can be used by disabled users for computer access
  - See later slides in this presentation



Digitiser (A-D Converter)



- A generic term for anything that converts analogue data into a digital format (Analogue-Digital Conversion)
- **Analogue:** Any *continuous* variable:
  - Music, human voice, film, drawings, (old) video, (old) pictures
  - Temperature, pressure, all 'natural' data
- **Digital:** Any variable that can be represented in *discrete* units:
  - Computer data, digital TV, computer networks (bits/bytes)

  http://electronics.howstuffworks.com/analog-digital.htm
- Modern vehicles have many sensors converting *analogue* data about the engine (oil pressure, engine temperature, rev counter etc.) into *digitised* data and feeding it to the vehicle's 'brain' (control unit).

Other Input Devices

- We have now covered just about all the INPUT peripherals that you will come across when using a computer – but there are some specialist ones that are less common:
  - Specially adapted devices for disabled users (covered later)
  - Industrial sensors (to monitor environmental parameters and processes)
    - SCADA is the industry standard
    - http://whatis.techtarget.com/definition/SCADA-supervisory-control-and-data-acquisition
  - Commercial devices such as RFID readers (the modern replacement for barcodes)