

Unit 1 Cornell Notes

1.1 Systems architecture

1.1.1 The purpose of the CPU

The purpose of the CPU	
The fetch-execute cycle	

1.1.1 Common CPU components and their function

ALU (Arithmetic Logic Unit)	
CU (Control Unit)	
Cache	
Registers	

1.1.1 Von Neumann architecture

MAR (Memory Address Register)	
MDR (Memory Data Register)	
Program Counter	
Accumulator	

1.1.2 How common characteristics of CPUs affect their performance

Clock Speed	
Cache Size	
Number of Cores	

1.1.3 Embedded systems

The purpose and	
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characteristics of embedded systems	
Examples of embedded systems	

1.2 Memory and storage

1.2.1 Primary storage (Memory)	
The need for primary storage. OCR GCSE (J277) 1.2 The need for primary storage	
The difference between RAM and ROM	
The purpose of ROM in a computer system	
The purpose of RAM in a computer system	
Virtual memory	

1.2.2 Secondary storage	
The need for secondary storage	
Optical	• Capacity • Speed • Portability • Durability • Reliability • Cost
Magnetic	• Capacity • Speed • Portability • Durability • Reliability • Cost
Solid state	• Capacity • Speed • Portability • Durability • Reliability • Cost
Suitable storage devices and storage media for a given application	

1.2.3 Units	
The units of data storage: • Bit • Nibble (4 bits) • Byte (8 bits) • Kilobyte (1,000 bytes or 1 KB) • Megabyte (1,000 KB) • Gigabyte (1,000 MB) • Terabyte (1,000 GB) • Petabyte (1,000 TB)	
How data needs to be converted into a binary format to be processed by a computer	
sound file size	
image file size	
text file size	

1.2.4 Data storage Numbers	
How to convert positive denary whole numbers to binary numbers (up to and including 8 bits) and vice versa Number representation	Explain these steps
How to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occur Binary Addition	 How To Add and Subtract Binary Numbers Compu...
How to convert positive denary whole numbers into 2-digit hexadecimal numbers and vice versa Number representation	Explain these steps
How to convert binary integers to their hexadecimal	Explain these steps

equivalents and vice versa	
Number representation	
Binary shifts	

1.2.4 Data storage Characters	
The use of binary codes to represent characters	
The term 'character set'	
The relationship between the number of bits per character in a character set, and the number of characters which can be represented, e.g.: o ASCII o Unicode	

1.2.4 Data storage Images	
How an image is represented as a series of pixels, represented in binary	
Metadata	
The effect of colour depth and resolution on: o The quality of the image o The size of an image file	

1.2.4 Data storage Sound	
How sound can be sampled and stored in digital form	
The effect of sample rate, duration and bit depth on: o The playback quality o The size of a sound file	

1.2.5 Compression	
The need for compression	
Types of compression: o Lossy o Lossless	

1.3 – Computer networks, connections and protocols

1.3.1 Networks and topologies	
Types of network: o LAN (Local Area Network) o WAN (Wide Area Network)	
Factors that affect the performance of networks	
The different roles of computers in a client-server and a peer-to peer network	
The hardware needed to connect stand-alone computers into a Local Area Network: o Wireless access points o Routers o Switches o NIC (Network Interface Controller/Card) o Transmission media	
The Internet as a worldwide collection of computer networks: o DNS (Domain Name Server) o Hosting o The Cloud o Web servers and clients	
Star and Mesh network topologies	

1.3.2 Wired and wireless networks, protocols and layers	
Modes of connection: o Wired • Ethernet o Wireless • Wi-Fi • Bluetooth	
Encryption	

IP addressing and MAC addressing	
Standards	
Common protocols including: o TCP/IP (Transmission Control Protocol/Internet Protocol) o HTTP (Hyper Text Transfer Protocol) o HTTPS (Hyper Text Transfer Protocol Secure) o FTP (File Transfer Protocol) o POP (Post Office Protocol) o IMAP (Internet Message Access Protocol) o SMTP (Simple Mail Transfer Protocol)	
The concept of layers	

1.4 Network Security

1.4.1 Threats to computer systems and networks

Forms of Attack:

<u>o Malware</u>	
<u>o Social engineering. e.g. phishing. people as the 'weak point'</u>	
<u>o Brute-force attacks</u>	
<u>o Denial of service attacks</u>	
<u>o Data interception and theft</u>	
<u>o The concept of SQL injection</u>	

1.4.2 Identifying and preventing vulnerabilities

Common preventions:

o Penetration testing	
o Anti-malware software	
o Firewalls	
o User access levels	
o Passwords	
o Encryption	
o Physical security	

1.5 Systems software

1.5.1 Operating systems

The purpose and functionality of operating systems:

<u>o User interface</u>	
<u>o Memory management and multitasking</u>	
<u>o Peripheral management and drivers</u>	
<u>o User management</u>	
<u>o File management</u>	

1.5.2 Utility software

The purpose and functionality of utility software	
o Encryption software	
o Defragmentation	
o Data compression	

1.6 Ethical, legal, cultural and environmental impact

1.6.1 Ethical, legal, cultural and environmental impact Impacts of digital technology on wider society including:	
o Ethical issues	
o Legal issues	
o Cultural issues	
o Environmental issues	
o Privacy issues	

1.6.1 Ethical, legal, cultural and environmental impact Legislation relevant to Computer Science:	
o The Data Protection Act 2018	
o Computer Misuse Act 1990	
o Copyright Designs and Patents Act 1988	
o Software licences (i.e. open source and proprietary)	