De La Salle School Computer Science Curriculum Year 10

2.2.1 Programming Fundamentals is taught once every two weeks across the year to prepare pupils for Paper 2. It develops core programming knowledge and skills, including the use of variables, constants, operators, inputs, outputs, and assignment. Learners will also apply the main programming constructs of sequence, selection, and iteration (count- and condition-controlled loops). Pupils will build an understanding of arithmetic and Boolean operators, including AND, OR, and NOT, and use comparison and arithmetic operators within a high-level programming language. The focus is on developing practical programming ability and understanding key concepts required for success in the written examination.

Year 10 Term 1

1.1 – Systems architecture

1.1.1- Architecture of the CPU

This unit introduces pupils to the architecture of the CPU and how it processes instructions. Learners will explore the purpose of the CPU through the fetch-execute cycle and develop an understanding of key components such as the ALU, Control Unit, cache, and registers. They will also study the Von Neumann architecture, including the roles of the MAR, MDR, Program Counter, and Accumulator, to understand how data and instructions are stored and processed within a computer system.

1.1.2- CPU Performance

This unit develops pupils' understanding of how the performance of a CPU is affected by key characteristics. Learners will explore clock speed, cache size, and number of cores, and understand how each factor influences processing speed and overall system efficiency. They will also consider how changes to these characteristics, individually or in combination, impact the performance of computer systems in real-world contexts.

1.1.3- Embedded Systems

This unit introduces pupils to the purpose and characteristics of embedded systems. Learners will

Year 10 Term 2

1.2.4 Data Storage

This unit teaches pupils how computers represent data. They will learn about binary, denary and hexadecimal numbers, binary addition and overflow errors, character encoding, and how images and sound are stored digitally. Pupils will also explore how factors such as resolution, colour depth, sample rate and bit depth affect quality and file size.

1.2.5 Compression

This unit introduces pupils to the need for data compression in computer systems and how it is used to reduce file sizes for storage and transmission. Learners will explore both lossy and lossless compression methods, understanding how each works and when they are most appropriate. Pupils will also evaluate the advantages and disadvantages of each type and consider the impact of compression on file quality and size in different contexts.

1.3 – Computer networks, connections and protocols

1.3.1 Networks and Topologies

This unit develops pupils' understanding of how computer networks are structured and how they operate. Learners will explore different types of network, including LANs and WANs, and understand factors that affect network performance. They will

Year 10 Term 3

1.4 – Network security

1.4.1-Threats to Computer Systems and Networks

This unit develops pupils' understanding of the different ways computer systems and networks can be attacked. Learners will explore a range of threats including malware, social engineering such as phishing, brute-force attacks, denial of service attacks, data interception and theft, and SQL injection. Pupils will understand how each type of attack works, why it is used, and the risks it poses to individuals and organisations.

1.4.2 Identifying and Preventing Vulnerabilities

This unit develops pupils' understanding of how computer systems and networks can be protected from common threats. Learners will explore a range of prevention methods, including penetration testing, anti-malware software, firewalls, user access levels, passwords, encryption, and physical security. Pupils will understand how each method works, what types of attacks it helps to prevent, and how vulnerabilities in systems can be reduced to improve overall security.

1.5 – Systems software

develop an understanding of what embedded systems are, how they are used in everyday devices, and their typical features such as being task-specific and resource-limited. Pupils will also explore a range of real-world examples to build familiarity with how embedded systems are used in modern technology.

1.2 – Memory and storage

1.2.1 Primary Storage

This unit introduces pupils to the role of primary storage in computer systems. Learners will understand why computers use primary storage, focusing on RAM and ROM, and how each is used within a system. They will explore the key characteristics and purposes of RAM and ROM, as well as develop an understanding of virtual memory, including why it is needed and how data is transferred between RAM and secondary storage when memory is full.

1.2.2 Secondary Storage

This unit develops pupils' understanding of why computers need secondary storage and the different types available, including optical, magnetic, and solid-state storage. Learners will explore a range of storage devices and media, and understand how their characteristics affect suitability for different applications. Pupils will also compare advantages and disadvantages in terms of capacity, speed, portability, durability, reliability, and cost, and apply their knowledge to real-world scenarios.

1.2.3 Units

This unit develops pupils' understanding of how data is represented and measured in computer systems.

study client-server and peer-to-peer models, as well as the hardware required to build a LAN, including routers, switches, wireless access points, NICs, and transmission media. Pupils will also learn how the Internet works as a network of networks, including the role of DNS, web servers, clients, hosting, and cloud services. Finally, they will examine star and mesh topologies, comparing their advantages and disadvantages and applying their knowledge to real-world scenarios.

1.3.2 Wired and Wireless Networks, Protocols and Layers

This unit develops pupils' understanding of how data is transmitted across networks using different connection types, protocols, and standards. Learners will compare wired (Ethernet) and wireless (Wi-Fi and Bluetooth) connections, and evaluate their advantages and disadvantages in different scenarios. They will explore how data is secured through encryption, and understand the role of IP and MAC addressing in identifying devices on a network. Pupils will also study key protocols such as TCP/IP, HTTP, HTTPS, FTP, POP, IMAP, and SMTP, understanding their purposes and basic functions. Finally, they will learn how layered models, such as the TCP/IP model, help organise communication processes and improve interoperability between systems.

1.5.1 Operating Systems

This unit develops pupils' understanding of the role and functions of an operating system in managing computer hardware and software. Learners will explore key functions including the user interface, memory management and multitasking, peripheral management and drivers, user management, and file management. Pupils will understand how operating systems control the transfer of data, manage system resources, support multiple tasks, and ensure secure and efficient use of a computer system.

1.5.2 Utility Software

This unit develops pupils' understanding of the purpose and role of utility software in maintaining and improving computer systems. Learners will explore how utility software performs essential "housekeeping" tasks to ensure systems run efficiently and securely. Pupils will study examples such as encryption software, defragmentation tools, and data compression utilities, and understand why each is needed and how they support the overall performance, organisation, and security of a computer system.

1.6 – Ethical, legal, cultural and environmental impacts of digital technology

1.6.1 Ethical, Legal, Cultural and Environmental Impact

This unit (OCR J277) develops pupils' understanding of how digital technology affects society. Learners will explore ethical, legal, cultural, environmental, and privacy issues, and consider the wider impact of technology on individuals and organisations. Pupils

Learners will explore units of data storage from bits through to petabytes and understand how data is converted into binary for processing. They will also calculate storage requirements for different file types, including sound, images, and text, using given formulas. Pupils will apply their knowledge of data capacity to real-world contexts and understand how file size impacts storage needs.		will also study key legislation including the Data Protection Act 2018, Computer Misuse Act 1990, and Copyright, Designs and Patents Act 1988, as well as different types of software licences such as open source and proprietary. They will develop the ability to discuss and evaluate the impact of technology and apply their understanding to real-world scenarios.
Knowledge, Skills and Understanding		
1.1.1- Architecture of the CPU - CPU and fetch-execute cycle - ALU (does calculations) - Control Unit (controls the CPU) - Cache (speeds up access to data) - Registers (store data temporarily) - Von Neumann architecture (how a computer works) - MAR (stores memory address) - MDR (stores data from memory) - Program Counter (keeps track of instructions) - Accumulator (stores results) **1.1.2- CPU Performance** - Clock speed: how fast the CPU works - Cache size: how quickly data can be accessed - Number of cores: how many tasks the CPU can do at once **1.1.3- Embedded Systems** - What embedded systems are - Purpose of embedded systems - Characteristics of embedded systems - Examples of embedded systems - Familiarity with different embedded systems	**1.2.4 Data Storage** **Numbers:** - Denary to binary conversion - Binary to denary conversion - Binary addition and overflow - Denary to hexadecimal conversion - Hexadecimal to denary conversion - Binary to hexadecimal conversion - Hexadecimal to binary conversion - Binary shifts (left and right) **Characters:** - Characters represented in binary - Character sets - ASCII and Unicode - Bits per character and number of characters represented - How computers store and display text - Differences between character sets - Ascii and unicode **Images:** - Images represented as pixels in binary - Metadata - Colour depth and image quality - Resolution and image quality	**1.4.1-Threats to Computer Systems and Networks** - Malware - Social engineering (e.g. phishing) - Brute-force attacks - Denial of service attacks - Data interception and theft - SQL injection **1.4.2 Identifying and Preventing Vulnerabilities** - Penetration testing - Anti-malware - Firewalls - Access levels - Passwords - Encryption - Physical security **1.5.1 Operating Systems** - User interface - Memory management and multitasking - Peripheral management and drivers - User management - File management

1.2.1 Primary Storage

- Need for primary storage
- Difference between RAM and ROM
- ROM purpose
- RAM purpose
- Virtual memory

1.2.2 Secondary Storage

- Need for secondary storage
- Types of storage: optical, magnetic, solid state
- Storage devices and media for different uses
- Advantages and disadvantages of storage types
- Capacity, speed, portability, durability, reliability, cost

1.2.3 Units

- Units of data storage (bit to petabyte)
- Binary data representation
- Why computers use binary
- Data capacity and storage calculations
- Calculating storage requirements for files

- Effect of colour depth on file size
- Effect of resolution on file size

Sound:

- How sound is sampled and stored digitally
- Sample rate
- Bit depth
- Duration of sound
- Effect on sound quality
- Effect on file size

1.2.5 Compression

- Need for compression
- Lossy compression
- Lossless compression
- Advantages and disadvantages of compression
- Effect of compression on file size and quality

1.3.1 Networks and Topologies

- LAN and WAN
- Network performance
- Client-server and peer-to-peer networks
- Network hardware
- DNS, hosting and the cloud
- Web servers and clients
- Star and mesh topologies

1.3.2 Wired and Wireless Networks, Protocols and Layers

- Wired and wireless networks
- Ethernet, Wi-Fi and Bluetooth
- Encryption
- IP and MAC addresses
- Network protocols
- Network layers

1.5.2 Utility Software

- Purpose of utility software
- Encryption software
- Defragmentation
- Data compression

1.6.1 Ethical, Legal, Cultural and Environmental Impact

- Impacts of digital technology on wider society including:

  Ethical issues
  Legal issues
  Cultural issues
  Environmental issues
  Privacy issues

- Legislation relevant to Computer Science:

  The Data Protection Act 2018
  Computer Misuse Act 1990
  Copyright Designs and Patents Act 1988
  Software licences (i.e. open source and proprietary)

2.2.1 Programming Fundamentals (Done once a week throughout year)

- Use of variables, constants, operators, inputs, outputs and assignments
- Understanding the three main programming constructs:
  - Sequence
  - Selection

		○ Iteration (count-controlled and condition-controlled loops) - Use of common arithmetic operators - Use of common Boolean operators: ○ AND ○ OR ○ NOT

Assessment and Assessment Focus

- Each sub-unit includes one 40-mark online team assessment to check pupils' understanding of the key concepts covered. The quiz provides instant feedback so pupils can quickly identify strengths and areas for improvement.
- Pupils will also complete regular knowledge recall activities at the start of lessons, usually consisting of five short questions based on previous learning. These help teachers identify gaps in understanding and decide whether pupils are ready to move on.
- Mini whiteboards will be used during lessons to quickly assess pupils' progress and understanding in real time.
- Teachers will provide demonstrations and use knowledge organisers to help pupils focus on the most important content and key terminology.
- Pupils will complete weekly homework using Smart Revise, which provides exam-board-created practice questions. Pupils receive instant feedback, a breakdown of strengths and weaknesses, and personalised revision lists. Teachers can also use homework leader boards to motivate and encourage pupils.
- At the end of the unit, pupils will complete a 45-minute exam under formal exam conditions. The paper is created using the OCR Exam Builder and assesses knowledge and understanding from the whole unit.
- The end-of-unit assessment will be marked by the teacher and used in a follow-up therapy lesson, where pupils review mistakes and improve gaps in their learning.