

Year 9: Computer Science		
Autumn Term	Spring Term	Summer Term
<p>1. Python Programming</p> <ol style="list-style-type: none"> 1.1. Text-based programming 1.2. Python Syntax 1.3. Sequencing 1.4. Selection 1.5. Iteration 1.6. Algorithmic thinking 1.7. Flowcharts 1.8. Variables 1.9. Data types 1.10. Casting 1.11. Input/Process/Output 1.12. Using an IDE 1.13. Test plan <p>Unit Objectives: Reinforcement of procedural programming concepts using text based programming. (Python) (Sequencing, Iteration, Selection, use of variables)</p> <p>Problem solving through Trial & Error / Troubleshooting, Abstraction & Decomposition</p> <p>Algorithmic Thinking using flowcharts</p> <p>Problem solving using maths concepts including arithmetic calculations (percentages, MOD/DIV, areas and volumes), x-y coordinates, Boolean logic.</p>	<p>2. Digital Data</p> <ol style="list-style-type: none"> 2.1. Binary Data 2.2. Storage units (bit, Byte, KB, MB, GB, TB, PB) 2.3. Binary Conversions 2.4. Hexadecimal Conversions 2.5. Binary Additions 2.6. Binary Shifts 2.7. Binary Masks 2.8. Logic Gates Diagrams 2.9. Truth Tables 2.10. Bitmap Pictures 2.11. Sound Sampling 2.12. Lossy/Lossless compression <p>Unit Objectives: Students investigate what is digital/binary data and how different form of information (e.g. numbers, text, pictures, sounds) are stored on computers in a binary form.</p> <p>Students will learn about:</p> <ul style="list-style-type: none"> • Binary numbers / conversions • Hexadecimal Conversions • Binary Additions • Logic Gates and Truth tables • ASCII Code / Unicode • Bitmap Pictures • Sampling Sound <p>This unit revisit the “history of computer” science, following the chronological development of computers and digital information.</p> <p>School Trip Opportunity: Computer Science Museum - Cambridge</p>	<p>3. Algorithmic Thinking</p> <ol style="list-style-type: none"> 3.1. Searching algorithms 3.2. Linear search 3.3. Binary search 3.4. Sorting algorithms 3.5. Insertion sort 3.6. Bubble sort 3.7. Merge sort 3.8. File handling 3.9. Abstraction 3.10. Decomposition 3.11. Algorithmic thinking <p>Unit Objectives: Reinforcement of procedural programming concepts using text based programming. (Python) (Sequencing, Iteration, Selection, use of variables) Use of subroutines.</p> <p>Algorithmic Thinking using flowcharts</p> <p>Problem solving through Trial & Error / Troubleshooting, Abstraction & Decomposition</p> <p>Investigating key algorithms used for searching data (Linear search, binary search) and sorting data (Sorting Algorithms)</p> <p>Applying linear search algorithm using data stored in a CSV file (File handling operations)</p>
<p>Assessment:</p> <ul style="list-style-type: none"> • Written Test 1 (1 hour) • Written Test 2 (1 hour) 	<p>Assessment:</p> <ul style="list-style-type: none"> • Written Test 3 (1 hour) • Written Test 4 (1 hour) 	<p>Assessment:</p> <ul style="list-style-type: none"> • Written Test 5 (1 hour) • Written Test 6 (1 hour)

Year 10: Computer Science

Autumn Term	Spring Term	Summer Term
<p>4. Programming Project</p> <ul style="list-style-type: none"> 4.1. Requirements Analysis 4.2. Top modular design 4.3. Data Dictionary 4.4. Flowcharts 4.5. Implementation 4.6. Procedural programming 4.7. Programming constructs 4.8. Iterative testing 4.9. Code sanitisation 4.10. Code maintainability 4.11. Final Testing 4.12. Evaluation <p>Unit Objectives: Students complete the controlled assessment programming project of the course (Scenario provided by the exam board) following the System Life Cycle:</p> <ul style="list-style-type: none"> • Analysis (Identifying user requirements, Decomposition) • Design (Algorithmic Thinking, flowcharts, Data Dictionary) • Implementation (Iterative Development of solution, iterative testing, troubleshooting) • Testing (Iterative and final testing) • Evaluation <p>Reinforcement of procedural programming concepts using text based programming. (Python) (Sequencing, Iteration, Selection, use of variables) Use of subroutines. File handling operations</p> <p>Problem solving through Trial & Error / Troubleshooting, Abstraction & Decomposition Algorithmic Thinking using flowcharts</p> <p>Assessment:</p> <ul style="list-style-type: none"> • Assessment of students coursework 	<p>5. Hardware Concepts</p> <ul style="list-style-type: none"> 5.1. CPU architecture 5.2. Von Newman Architecture & registers 5.3. FDE Cycle 5.4. Clock speed 5.5. Multi-core 5.6. Cache memory 5.7. Embedded systems 5.8. Primary memory (RAM/ROM) 5.9. Virtual memory 5.10. Secondary memory 5.11. Optical storage devices 5.12. Magnetic storage devices 5.13. SSD storage devices 5.14. Storage capacity calculations <p>Unit Objectives: Students develop their subject knowledge regarding the hardware components of a computer systems. They can identify different hardware components of a computer system, describe their purpose and key characteristics, compare a range of input, output and storage devices to identify the most suitable devices for a given scenario.</p> <p>Students investigate storage units and storage requirements vs. capacity calculations.</p> <p>Assessment:</p> <ul style="list-style-type: none"> • Online Assessments • Mock Exam (1 hour 30 minutes) 	<p>6. Software Concepts</p> <ul style="list-style-type: none"> 6.1. Operating Systems 6.2. Utilities 6.3. Defragmentation 6.4. Encryption 6.5. Incremental/full backups 6.6. Drivers 6.7. Application software 6.8. Translators (Compiler/interpreter) 6.9. IDEs <p>Unit Objectives: Students investigate the different types of software and their purposes and key characteristics (Operating Systems, Utilities, Drivers, Application Software, Translators, IDEs).</p> <p>They compare the use of open source software vs proprietary software.</p> <p>They compare desktop applications and cloud based applications.</p> <p><i>End of Summer Project: Students investigate Web based technologies (HTML, CSS, JavaScript) to create a revision page.</i></p> <p>Assessment:</p> <ul style="list-style-type: none"> • Online Assessments • Written Test (1 hour)

Year 11: Computer Science

Autumn Term

2. Network Concepts

3. LAN vs WAN
4. Network Topologies
5. Client/Server Networks
6. Network components (Switch, hub, firewall, router, wap)
7. Types of servers
8. Wireless transmission (WiFi, 3G/5G)
9. Wired transmission (Ethernet Cable)
10. TCP Stack
11. TCP/IP Protocols
12. Packet Switching
13. IP Addresses
14. MAC Addresses
15. Web hosting & DNS Servers
16. Network Security (Threats and solutions to secure a network)

Unit Objectives:

Students develop their subject knowledge regarding **network technologies & concepts**. They first investigate the different hardware components needed to set up a LAN. (Switch, Hub, WAP, NIC cards, Firewall, Router) and then investigate Internet concepts (Packet switching, IP Protocols concepts)

Students also investigate a range of network threats and for each threat identify possible solutions to minimise the threat.

Assessment:

- Online Assessments
- Mock Exam (1 hour 30 minutes)

Spring Term

Legal, Ethical, Environmental Impacts of Computer Science

- Data Protection Act *and GDPR*
- Copyright Design & Patent Act
- Freedom of Information Act
- Computer Misuse Act
- Creative Commons Licensing
- Environmental Impacts
- Contribution to global warming
- Ethical Impacts
- Information reliability, Fake News
- Digital Divide
- Working conditions
- Monitoring
- Freedom of speech

Unit Objectives:

Students discuss the **legal, ethical environmental impacts** of computer science making reference to a range of news stories. They identify both positive and negative impacts.

They learn about the different **legal acts** relevant to computer science:

- Data Protection Act *and GDPR*
- Copyright Design & Patent Act
- Freedom of Information Act
- Computer Misuse Act
- Creative Commons Licensing

Assessment:

- Online Assessments
- Mock Exam (1 hour 30 minutes)