

YEAR 10 | COMPUTER SCIENCE

The curriculum and assessment of students at this stage of education has been carefully designed to promote deep learning of computer science and develop students into computer scientists that hold sector specific knowledge and skills gained through a practical learning environment.

In year 10, students build on skills and knowledge of text-based programming using the Python language. They will learn how to effectively write programs through using a range of advanced programming techniques that allow them to meet all the needs of various scenarios. The scenarios that students will experience will develop their creative, independent and cultural skills.

Students will also develop their understanding of computational thinking and apply this knowledge when producing their own solutions to problems. Students will develop skills in breaking down problems and designing, developing testing and evaluating their solutions. Students will develop their programming skills further by learning about additional file handling techniques and how to test programs appropriately. By the end of the year, students will have been given the opportunity to design, develop, test and evaluate their own programs.

They will have an excellent understanding of a range of programming techniques that will also enable them to produce algorithms in the way of a flowchart and pseudocode. Throughout the year, students will be provided with a range of different challenges and projects that vary in difficulty and allow them to showcase their programming ability. Students will also be given the opportunity to develop their knowledge of computer systems through a theory-based component where students will gain an understanding of key topics such as: systems architecture, memory and storage, computer networks, connections and protocols, network security, systems software and ethical, legal, cultural and environmental impacts of digital technology. Students will apply the knowledge they have gained when answering exam questions and use the subject terminology required at this level.

They year 10 course will prepare students for year 11 where they will continue to develop their understanding of computer systems and algorithms.

HALF TERM 1

Computer Systems / Programming

All students will know:

Component 1:

- CPU
- Primary & Secondary Storage
- Data Representation
- Cloud Computing

Component 2:

- Sorting & Searching Algorithms
- Logic Gates & Truth Tables
- Algorithms
- Pseudocode
- Flowcharts
- Programming (Sequence, Selection, Iteration)
- Programming Challenges

All students will be assessed:

Students will all be assessed and receive feedback on the work they have completed in lessons in the following ways:

- Do Now activities
- Live Marking
- Their ability to design, develop and test programs.

A summative assessment at the end of the term on data representation, storage, logic gates and algorithms.

Reading skills needed for this unit:

Basic reading skills are needed to decompose questions.

Key vocabulary:

High-level languages, Pseudocode, computer system, embedded system, PC, ALU, Control Unit.

ENRICHMENT OPPORTUNITIES

Regular revision sessions are made available to students throughout the year to develop their skills in the subject. Students have the opportunity to attend weekly clubs to develop their programming skills. This programming club will allow students to look at a range of scenarios and use their skills to break these down and produce fully working solutions. Students can also use this time to develop their skills in other programming languages.

HOW THIS LEARNING WILL BE EMBEDDED ELSEWHERE IN THE CURRICULUM

The computing curriculum has links to mathematics. Examples include studying and writing algorithms and using mathematical operators in programs. Students are required to learn and use various sorting and searching algorithms as well as performing calculations using different number systems.

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HALF TERM 2

Threats to Networks / Computational Thinking

All students will know:

- Component 1:
- Threats
 - Prevention Methods
- Component 2:
- Flowcharts
 - Pseudocode
 - Programming
 - Trace Tables
 - Computational Thinking

All students will be assessed:

- Students will all be assessed and receive feedback on the work they have completed in lessons in the following ways:
- Programming Challenges
 - Do Now activities
 - Whole class feedback
 - Verbal feedback
 - Live Marking

A summative assessment will be used at the end of the term to assess the programming skills of students and their ability to produce algorithms.

Reading skills needed for this unit:

Basic reading skills are needed to decompose questions and understand what needs to be included in solutions, especially when writing computer programs.

Key vocabulary:

Trace tables, count-controlled loops, condition-controlled loops, iteration, sequence, selection, testing.

HALF TERM 3

Networks / Programming

All students will know:

- Component 1:
- Security Risks
 - Networks
 - Topologies
 - Client Server Networks
 - Peer-to-peer Networks
 - Protocols
 - Transmission Media

Component 2:

- Programming Challenges (Real-life scenarios)
- Algorithms (Pseudocode & Flowcharts)

All students will be assessed:

- Do Now activities
- Live Marking
- Their ability to design, develop and test programs.

Key Assessment Point 1 - A summative assessment at the end of the term will be used, this will be the midpoint assessment on topics covered throughout the course with an emphasis on networking.

Reading skills needed for this unit:

Students will be required to read questions and identify what they must include within their answers. They must be confident in using abstraction and decomposition.

Students will also be required to read real-life scenarios when completing programming challenges so they can identify what they need to include within their solutions.

Key vocabulary:

Topologies, client-server, peer-to-peer, hardware, switch, router, threats, brute force, trojan horse, ransomware.

HALF TERM 4

Testing / Advanced Programming Skills

All students will know:

- Trace Tables
- Testing
- Lists
- File Handling
- Sub-programs (Procedures & Functions)
- Defensive Design
- Maintainability

All students will be assessed:

- Students will all be assessed and receive feedback on the work they have completed in lessons in the following ways:
- Do Now activities
 - Live Marking
 - Whole class feedback
 - Their ability to design, develop and test programs.

A summative assessment at the end of the term on programming where students will showcase their programming skills and will show that they can produce algorithms for a range of scenarios. Students will be required to produce the algorithms and programs on paper and will then be able to transfer this to a high-level language.

Reading skills needed for this unit:

Students should be able to read a piece of text and identify key points, so they know which tests for a program need to be carried out. They also need to be confident in reading a piece of code and following this through based on the programming techniques used such as: sequence, selection and iteration.

Key vocabulary:

Integrated Development Environment (IDEs), Functions, Procedures, Arrays, Comments, Sub-programs, Normal, Boundary, Erroneous, Testing, Variables.

YEAR 10 | COMPUTER SCIENCE

HALF TERM 5 Image and Sound Representation / Operating Systems

All students will know:

Component 1:

- Image Representation
- Sound Representation
- Operating Systems
- Storage
- Utility Software

Component 2:

- Structured Query Language (SQL)
- Algorithms (Flowcharts & Pseudocode)
- Computational Thinking
- Programming

All students will be assessed:

Students will all be assessed and receive feedback on the work they have completed in lessons in the following ways:

- Do Now activities
- Live Marking
- Their ability to design, develop and test programs.

A summative assessment will be completed on image and sound representation - other topics will be included in this assessment.

Students will also complete an assessment of operating systems and utility software.

Reading skills needed for this unit:

Students will need basic reading skills so they can highlight key points in a piece of text and pick out key information when calculating different file sizes. They will need to use this skill to pick out key values within a piece of text such as the bit depth from an image.

Key vocabulary:

Amplitude, bit depth, sample rate, resolution, pixels, SQL, Flowchart, Pseudocode, Algorithm, Sequence, Selection, Iteration, Encryption, Compression, Defragmentation

HALF TERM 6 Advanced Programming / NEA

All students will know:

Component 1:

- Extended Questions
- Legal, Ethical, Environmental Issues
- Revision

Component 2:

- Revision
- Functions
- Procedures
- 1d Arrays
- 2d Arrays
- File Handling

(NEA):

- Students will be given a large programming task and will need to design, develop, test and evaluate their solution. They will be using abstraction and decomposition to support when working with the problem.

All students will be assessed:

Students will all be assessed and receive feedback on the work they have completed in lessons in the following ways:

- Do Now activities
- Live Marking
- Whole class feedback
- Peer-assessment / Self-assessment

Students will be assessed on the 8-mark questions they complete during lessons.

They will all have the opportunity to complete an NEA in which they will receive feedback on their programming skills.

Key Assessment Point 3 - Students will be completing a mock exam for C01 – Computer Systems and C02 – Computational Thinking, Algorithms and Programming. Past exam papers will be used for this mock exam to give students the chance to view real exam papers and to see how questions are presented.

Reading skills needed for this unit:

Students will need to be able to decompose problems and abstract key information. They are required to concentrate on the key points in the problem and ignore unnecessary information. Students will also be required to read extended questions and produce well-developed answers about the situation provided.

Key vocabulary:

Arrays, Functions, Procedures, Sub-programs, file handling, abstraction, decomposition, algorithms, computational thinking.

HOW STUDENTS CAN BE SUPPORTED AT HOME

The following website has videos available for each of the topics included in the GCSE computer science qualification - www.youtube.co.uk/craigndave.

Students are provided with a CGP OCR computer science revision guide which should be used to support the course. The department would strongly recommend the purchase of the OCR practice paper workbook which has sample questions and solutions from past papers - <https://www.amazon.co.uk/GCSE-Computer-Science-Practice-Workbook/dp/1782946039>.

The OCR text book is also a useful aid to the course content - <https://www.amazon.co.uk/OCR-GCSE-9-1-Computer-Science/dp/1910523089>.

The Khan Academy is a useful website that students can use to support their studies - <https://www.khanacademy.org>.

YEAR 11 | COMPUTER SCIENCE

The curriculum and assessment of students at this stage of education has been carefully designed to promote deep learning of computer science and develop students into computer scientists that hold sector specific knowledge and skills gained through a practical learning environment:

In year 11, students will continue to build on the skills and knowledge developed at KS3 and in the previous year of study. They will continue to develop their understanding of computer systems, computational thinking, algorithms and programming. Students will be given the opportunity to develop their knowledge of networks by looking deeper into how devices communicate. They will encounter physical devices as well as theoretical understanding involving the use of protocols, addresses, cloud computing and client server approaches. We wish to instill a balanced approach to learning with students being able to evaluate different approaches to networking. During this year students will explore the wider issues that surround and use of technology. They will develop their understanding of legislation including the data protection act, computer misuse act and copyright. They will explore the environmental aspects and the impact on both individuals and society. They will develop their cultural

awareness and how they can play a responsible role in society. Students will continue to work on their programming skills by being given the opportunity to produce solutions to a range of complex problems related to real-life scenarios. They will be expected to produce solutions in the form of algorithms and programs which will allow them to develop their logical thinking and problem-solving skills. This will also aid with the development of answers when working with the practical based topics on: algorithms, programming, robust programs, Boolean logic, programming language and integrated development environments. Students will also develop their understanding of the CPU and the components that form it. They will be able to identify the registers and their purpose as well as the purpose of the ALU, clock and control units. We will further develop students' understanding of exam techniques by utilising past exam questions and mark schemes. Students will be heavily exposed to the technical language used in the exam papers to ensure that they are ready and able to access paper one and two. The full course can prepare students with the knowledge, skills and understanding necessary for further study at BTEC level3 or A level and builds a strong foundation for students considering a career in computer science.

HALF TERM 1 SYSTEMS ARCHITECTURE / NETWORKS / PROGRAMMING PRACTICAL

All students will know:

- » Von Neumann Architecture.
- » CPU components, functions and performance.
- » Storage technologies.
- » Memory.
- » Wired and wireless networks.
- » Network topologies, protocols and layers.
- » Threats to networks.

All students will be assessed:

- » 'Do now' tasks and live marking in lesson.
- » Completion of sample exam questions.
- » **Key Assessment Point 1** – Students will be given the opportunity to complete a mock exam paper. This will consist of content from C01 and C02. Students need to recognise key vocabulary in text and pick out key information.

Reading skills needed for this unit:

Students need to recognise key vocabulary within a piece of text and pick out key information. Students need to show they can use decomposition to break complex problems down.

Key vocabulary:

PC, REGISTERS, ALU, MAR, MDR, ACC, PC, LAN, WAN, RAM, ROM.

CURRICULUM AND ASSESSMENT PLAN

YEAR 11 | COMPUTER SCIENCE

HALF TERM 2 ETHICAL, LEGAL, CULTURAL AND ENVIRONMENTAL ISSUES / DATA REPRESENTATION / PRODUCING ROBUST PROGRAMS / PROGRAMMING PRACTICAL

All students will know:

- » Ethic, legal, cultural and environmental issues affecting technology.
- » Open source and proprietary software.
- » Defensive design.
- » High- and low-level languages.
- » Compilers and interpreters.
- » Images, sound and compression.

All students will be assessed:

- » Summative at the end of the term by completing an assessment to cover current and prior learning.
- Do Now activities will be used in each lesson to assess prior learning.
- Live marking will be used to allow students to gain instant feedback.
- Students will be given the opportunity to complete previous exam questions based on the topics they are studying.
- Previous exam questions will be used during Do Now activities to give students the opportunity to see how questions are worded.

Reading skills needed for this unit:

Students will need to read questions and pick out key information within the text. They need to read a piece of text and break down scenarios so they can decide on what should be done.

Key vocabulary:

Stakeholders, legislation, data protection, copyright, creative commons, freedom of information, privacy, maintainability

HALF TERM 3 INTERLEAVING REVISION / PROGRAMMING SKILLS / ALGORITHMS

All students will know:

- » 1.2 Memory & Storage
- » 1.4 Network Security
- » 1.5 System Software
- » 2.1 Algorithms
- » 2.2 Programming Fundamentals
- » 2.3 Robust Programs
- » 2.4 Boolean Logic
- » 2.5 Programming languages and IDEs

All students will be assessed:

- » Do now tasks and live marking in lesson.
- » Sample exam questions will be used to allow students to see what real exam questions are like and for them to have the opportunity to self-assess using the appropriate mark scheme.
- » **Key Assessment Point 2** – Students will be completing mock exams during this period and will have the opportunity to complete a C01 – Computer Systems and C02 – Computational Thinking, Algorithms and Programming exam paper.

Reading skills needed for this unit:

Students need to recognise key vocabulary in text and pick out key information. They also need to be able to read exam questions and identify key information.

Key vocabulary:

Compression, Bit Depth, Sample Rate, Character Set, Metadata, Malware, Prevention.

HALF TERM 4 INTERLEAVING REVISION / PROGRAMMING SKILLS / ALGORITHMS

All students will know:

- » 1.1 System Architecture
- » 1.3 Computer networks, connections & protocols
- » 1.6 Ethical, legal, cultural & environmental impacts of digital technology
- » 2.1 Algorithms
- » 2.2 Programming Fundamentals
- » 2.3 Robust Programs
- » 2.4 Boolean Logic
- » 2.5 Programming languages and IDEs

All students will be assessed:

- » Do now tasks
- Live marking during lessons to give students instant feedback and to allow them to improve their knowledge and understanding.
- » Completion of sample exam questions.
 - » Summative at the end of the term by completing an assessment to cover current and prior learning.

Reading skills needed for this unit:

Students should be able to read texts and pick out key information to produce answers.

Key vocabulary:

CPU, Registers, Topologies, Client server, Authentication, Maintainability, Defensive Design, Validation, Verification.

HALF TERM 5 REVISION AND EXAM

All students will know:

- » How to respond to exam questions appropriately.
- » Computer systems.
- » Computational thinking and problem solving.

All students will be assessed:

Students will be externally assessed by completing two exam papers:

- » **J277/01** - Computer systems.
- » **J277/02** - Computational thinking, logic and programming

ENRICHMENT OPPORTUNITIES

A regular programme of computing revision is offered throughout the year where students can complete practical tasks to support their understanding. Everyone is welcome to join a cybercrime extracurricular programme provided by the government. Students can use this to improve their understanding of crime whilst developing their problem-solving skills. A programming club is offered where students can attend and practice writing programmes for real life scenarios. They can programme using Micro Bits, Raspberry Pis and various sensors to bring programming to life.

HOW THIS LEARNING WILL BE EMBEDDED ELSEWHERE IN THE CURRICULUM

The computing curriculum has links to mathematics. Examples include studying and writing algorithms and using mathematical operators in programs. Students are required to learn and use various sorting and searching algorithms as well as performing calculations using different number systems.

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