



Intent

- Understand and appropriately use a greater range of programming techniques and data structures.
- Gain a deeper understanding of the fundamental concepts of Computer Science from GCSE.
- Use and develop computational models which underpin these concepts.
- Enable learners to think creatively, innovatively, analytically, logically and critically.

Computer Science

Year 12

Programming (All year)

Data structures and algorithms (Autumn Term)

Theory of Computation (Spring Term)

Data representation (Autumn Term)

Hardware and systems (Spring Term)

Knowledge
(facts, information, concepts and key terminology)

- Recap on all skills from GCSE
- Exception handling
- Interface design
- Stack frames
- Recursion
- OOP

- List / array, dictionary, queue, stack, tree, hash tables, graph, vector.
- Processing data in each structure using common algorithms.
- RPN
- Dijkstra

- Abstraction.
- FSM, Mealy machines
- Turing machine
- Halting problem
- Sets
- Regex
- BNF
- Big O

- Number systems
- Number bases
- Units of information
- Binary: unsigned, 2's complement, fractional numbers, normalisation
- ASCII and Unicode
- Error checking
- ADC
- Bitmaps
- Sound representation, including MIDI
- Encryption

- Logic gates
- Fetch-decode-execute cycle
- Hardware.

Understanding
(ability to connect and synthesise knowledge within a context)

- Write imperative and functional programs

- Trace pseudo-code algorithms.
- Describe the operations of the above data structures.
- Implement data structures and key algorithms in a high-level language.

- Trace FSMs, Mealy machines and Turing machines.
- Describe the halting problem.
- Use regex and set notation to describe sets.
- Use BNF to parse strings of data.
- Explain efficiency of algorithms using Bog O notation.

- Explain how bitmap images are represented. Convert between number bases.

- Simplifying Boolean expressions Explain categories of programming language.
- Describe internal components of a computer.
- Explain how computer process machine code.

Formal Assessments
(those done by all/vast majority of the cohort)

Covered in each assessment from December onwards.

Covered in each assessment from October onwards.

Covered in each assessment from March onwards.

Covered in each assessment from October onwards.

Covered in each assessment from October onwards.

By the end of the year students on course for at least a grade C will...