



Computer Science

We will explore the importance and scope of modern computing as it reaches into all aspects of our lives and careers. Looking at topics such as; artificial intelligence and it's effects on society, how a self-driving car works, how to develop something as complex as a new computer game, how the internet works to enable our transactions and communications.

You will develop valuable skills in problem solving and programming by taking Computer Science, an area of the economy which has huge potential for careers and earning.

What will you study in Year 12?

Computer systems

- The characteristics of contemporary processors, input, output and storage devices
- Software and software development
- Exchanging data
- Data types, data structures and algorithms
- Legal, moral, cultural and ethical issues

Algorithms and programming

- Elements of computational thinking
- Problem solving and programming
- Algorithms
- Artificial Intelligence

Programming project

- Analysis of the problem
- Design of the solution
- Developing the solution

What will you study in Year 13?

Programming project

- Developing the solution
- Evaluation

Algorithms and programming

- Measures and methods to determine the efficiency of different algorithms

- Algorithms for the main data structures
- Dijkstra's shortest path algorithm, A* algorithm
- Thinking concurrently

Computer systems

- De Morgan's Laws
- Linked-list, graph (directed and undirected), stack, queue, tree, binary search tree, hash table.
- Floating point arithmetic, positive and negative numbers, addition and subtraction
- Bitwise manipulation and masks

How will you be assessed during the course?

In school assessments

You will complete activities based on the units of work that we are studying to show your understanding. You will also write code to solve problems and debug code with errors to show mastery of the Python language, Object Oriented programming and the Pygame module.

External assessments

The examination board is OCR.

Specification: GCE Computing Science A-level

Code: H446

There are three modules assessed in May/June of the Year 13.

- Computer Systems (01): covering the fundamental computing knowledge required to support all subsequent units of study. (40%)
- Algorithms and Programming (02): Computational Thinking, Programming Techniques and Logical Methods. (40%)
- Programming Project(03): A substantial user-driven project, requiring analysis and design, which is developed over an extended period of time. (20%)

What skills will I develop?

The course will enable you to:

- work in small teams to analyse problems, design algorithms and write programs;
- develop the ability to apply skills, knowledge and understanding of computing, including programming, in a range of contexts to solve problems; and
- gain an understanding of the consequences of using computers, including legal, moral, cultural and ethical issues.

Where will this course lead?

A-level Computer Science acts as a springboard to a wide variety of Computer Science based degrees. Many students continue their Computer Science studies at university to gain qualifications in subjects such as cyber security, artificial intelligence, system engineering and games programming, leading to employment as cyber security consultants, web designers, games programmers, artificial intelligence researchers and many other computing related areas.

Further Information

What other subjects should I study with Computer Science?

Computer Science is compatible with most other A-level subjects. Students who opt for Computer Science find it complements a wide range of other subjects; courses such as Mathematics, Further Mathematics, Economics, Psychology and Physics are a good combination to take with Computer Science.

Supercurricular activities that are available

Students are encouraged to attend lunchtime workshops to work on code together and to solve algorithmic problems. The department enters students every year to the Bebras computational thinking competition. The British Informatics Olympiad allows our students to test their programming skills and compete with other top schools in the UK. In addition we run an ongoing coding challenge leaderboard via a range of online code sites to motivate and keep students fresh in their problem solving skills.

As well as being involved in the Amazon Future Engineer scheme where exciting speakers deliver talks on the most cutting edge uses of computer science technology, we also visit museums and exhibitions to see the history and effect of computer science. Such locations include Bletchley Park where the WWII code breakers masterminded the cracking of vital German codes.

Extension and support that is offered

Students can attend one-to-one or group sessions during lunchtime workshops, to help master and understand the theory and application of concepts and code.

Further information

Examination board

<http://www.ocr.org.uk/qualifications/as-a-level-gce-computer-science-h046-h446-from-2015/>

Careers in Computer Science

<https://www.bcs.org/category/5672>