

Subject:

# Computer Science

Computer Science Intent:

The aim of this course is to help students to understand the core academic principles of computer science. Classroom learning is transferred in to creating real-world systems through the creation of an independent project. The A level will develop the student's technical understanding and their ability to analyse and solve problems using computational thinking.

Our Exam Board is: OCR

## The Big Questions...

### Year 12

- **September – December:** What is the structure and function of the processor? What types of processor are there and what is input, output and storage? What is the purpose of operating systems and what are the different types for? How is memory managed within a computer? What is the nature of applications software? What are the different elements of computational thinking and what are they used for? What are local and global variables? What is the difference between passing parameters by reference or by value? How does object oriented programming differ from iterative programming? How are software development methodologies different?
- **January – April:** How is data exchanged between different systems? How do you program websites using HTML, CSS and Javascript? How does the server side differ from client side processing in a website? How is data stored within different structures such as a stack or queue? What are the algorithms for adding data to and removing data from different data structures? How does a linear and binary search work? How do bubble sort, insertion sort, merge sort and quick sort work?
- **May-July:** How do ethical, legal, cultural, environmental and privacy issues impact on wider society through the use of technology. What is the purpose of the Data Protection Act, Computer Misuse Act, the Regulation of Investigatory Powers Act, Copyright Designs and Patents Act and what do they allow or prohibit? How is an ERD produced for a database? How do you normalise data to third normal form? How do I program a database using SQL? How do I improve my exam technique to ensure a good grade in the exams?
- **Ongoing:** How do I solve problems by programming? How do I solve a large problem, e.g. a game, and what documentation do I produce for the project lifecycle.

### Year 13

- **September – December:** How do we represent numbers in binary and hexadecimal? How are sign and magnitude and two's complement used to represent negative numbers in binary? How do we add and subtract binary numbers? How do we represent positive and negative real numbers using normalised floating point representation? What is bitwise manipulation and mask shifts? How can the efficiency of an algorithm be measured in Big O notation? How does Dijkstra's shortest path algorithm and A\* algorithm work?  
**January – April:** How do compression, encryption and hashing work? What are logic gates and how do truth tables work? How are Boolean expressions simplified and why is this important? What is a Karnaugh map and how do I solve them. How do I analyse the performance of an algorithm?
- **May – July:** How do I improve my exam technique to ensure a good grade in the exams?
- **Ongoing:** How do I solve a large problem, e.g. a game, and what documentation do I produce for the project lifecycle.

### What skills will I develop?

- You will develop an understanding and ability to apply the fundamental principles and concepts of computer science, including abstraction, decomposition, logic, algorithms and data representation.
- You will develop the ability to analyse problems in computational terms.
- You will develop the capacity to think creatively, innovatively, analytically, logically and critically.
- You will develop your programming skills both iteratively and through object oriented programming.

### What great resources can I use?

- Craig and Dave on-line teaching videos for each A level Computer Science topic (youtube).
- Isaac A Level Computer Science – a free online learning platform for A level students.
- <https://www.ocr.org.uk/qualifications/as-and-a-level/computer-science-h046-h446-from-2015/> - exam board website with the full Computer Science A level specification.

### How will I be assessed?

Homework will be set when appropriate, with details on SMHW, feedback will be given. A mini mock will be given in January y12. End of year exams will take place in Year 12, where you will sit two half A level papers and be graded using the OCR grade boundaries. In year 13 you will sit two full A level papers in the mocks and be graded using the OCR grade boundaries.

**Examination:** The end of the A level course is 80% exam-based and will involve two A level papers, taken at the end of Year 13. Both papers are 2hrs 30mins long.

**Project:** This is worth 20% of the final grade. This is generally produced during y12 and y13 and handed in at the beginning of May, y13.

### Three ways that parents/carers can help...

1. Discuss news stories on how technology affects society, this is particularly useful in the ethical, legal, cultural and environmental topic of the course.
2. Provide support on timescales especially with the A level project.
3. Help students to find which revision style suits them the most and encourage them to use it when revising for exams.

