

## **Computer Science**

### **AQA A-level Computer Science (7517)**

**Head of Department: Ms Sorina Biletschi**

#### **Introduction**

Advances in Computer Science are transforming the way we work and live, with robotics, artificial intelligence and machine learning developments regularly featuring in the news. The AQA Computer Science specification has changed with the times and its content is highly relevant and current, expertly preparing students for Computer Science degrees. The direct relevance of the skills learnt in this course to almost all modern vocations, including Medicine, Music and Art, mean Computer Science A-level is useful for a wide range of future careers, but it should particularly be considered by those thinking about Computing and Science-related degrees, as well as Engineering.

Able and qualified computer scientists and programmers are in huge demand, and there is no shortage of rewarding employment opportunities available for computing specialists. Computer Science A-level therefore provides an exciting opportunity for those who are keen to be at the forefront of addressing challenges and solving a variety of problems in the UK and beyond.

#### **Subject Requirements**

The nature of the course is that it includes substantial computational logic and advanced mathematical content. This means students need a Grade 8 or above in GCSE Maths. Computer Science GCSE is not required but, if taken, students should have achieved a Grade 8 or above to indicate their aptitude for A-level.

Alongside this, students should have some prior experience of programming (this does not have to be advanced) and a proven interest in coding.

#### **Course Outline**

This A-level provides opportunity to develop programming skills at an advanced level, learn how computers work, solve logical problems, and be creative working on a programming project of interest for the coursework component.

**Programming languages:** C# is used for the Paper 1 exam. Any high-level language suitable for the chosen project can be used for the NEA, in discussion with the HoD. Popular choices with past students include C# with Unity (for 2D/3D games projects), Python (machine learning investigation), or Xcode (for Apple projects).

**Paper 1: (40%) 2½ hr on-screen exam, based on a pre-released skeleton program.**

Topics assessed:

- Fundamentals of programming (procedural and object-oriented paradigms)

- Fundamentals of abstract data structures (queues, stacks, graphs, trees, hash tables, dictionaries, vectors)
- Fundamentals of algorithms (eg graph and tree traversals, reverse Polish notation, shortest path, recursive)
- Theory of computation

**Paper 2: (40%) 2½ hr written exam. Topics assessed:**

- Fundamentals of data representation
- Fundamentals of computer systems
- Fundamentals of computer organisation and architecture (including assembly programming)
- Consequences of uses of computing (legal, moral, ethical)
- Fundamentals of communication and networking
- Relational databases, normalisation and SQL
- Big data
- Fundamentals of functional programming (used in data science and machine learning). We will use Haskell programming language to demonstrate and practise these techniques.

**Non-exam assessment (NEA):** (20%) Internally assessed report documenting a programmed solution to a real problem chosen by the student based on their interests.

### Higher Education and Careers

Whilst A-level is not necessarily a requirement for a degree, OEs who have taken Computer Science at university have reported that their A-level studies were hugely helpful and gave them a massive head start with programming, as well as most other topics.

A-level is not only useful for those who proceed to Computer Science degrees however, and the skills and experiences gained are applied in a wide range of fields including data science and healthcare, robotics, creating games, and cybersecurity to name just a few. Most entrepreneurs cannot imagine having achieved success without their theoretical and practical knowledge of programming, and the skills learnt in A-level Computer Science are directly useful in many degrees, apprenticeships, and areas of employment.

### What should I study alongside Computer Science?

The mathematical content of Computer Science A-level means that all students taking the course must study at least core maths (a core curriculum option) alongside it. It is recommended however that A-level Maths, and possibly also A-level Further Maths, are studied

alongside Computer Science. This is not only useful for success at A-level but Maths A-level is also a requirement for Computer Science degree courses.

Beyond this, the subject goes well with sciences as well as other creative and innovative subjects like Music and Art.

**Is there anything else I should consider?**

Students studying Computer Science A-level complete significant independent programming during the course and will therefore need a Windows laptop. Suggested spec: Core i7, 16GB RAM, min 512GB storage – SSD recommended; and to not be used for gaming.