

Computer Science

What will I learn?

During year 10 the focus will be on Paper 2: Computational thinking & algorithms. The topics on this paper require students to understand and apply the fundamental principles of computer science and expects that students will be able to analyse and solve problems in terms of designing, coding and testing programs. This paper is divided into five topics as outlined below.

Algorithms

This will examine computational thinking and the steps involved which include being able to decompose a problem, filter out unnecessary details and create algorithms in the form of flow charts and reference language. This section also involves the study of some common searching & sorting algorithms including the bubble sort and the binary search.

Programming Fundamentals

This examines a variety of programming techniques including variable, data types, selection, iteration, string manipulation, functions and file handling. Students will be required to design and code solutions using these techniques.

Producing Robust Programs

This focuses on defensive design and testing. The emphasis is on designing programs that will not crash and are error free. This will involve understanding the main defensive design techniques such as verification and validation along with being able to recognise syntax and logic errors in code and know how to fix them.

Boolean Logic

This involves the understanding of logic gates and their rules and how they are represented as truth tables and circuit diagrams. Students will be required to analyse a scenario and identify the logic being used as well as to interpret a Boolean expression and draw appropriate truth tables and circuit diagrams.

Programming Languages & IDEs

This focuses on the development of programming languages from machine code, to low level languages to high level languages that you will be more familiar with today. It involves understanding how your programs are translated so that they can run on the computer and the integrated development environments that we use for programming.

During year 11 the focus will be on Paper 1: Computer Systems. This examines the underlying principles of computer systems. This paper is divided into six topics as outlined below.

Systems Architecture

This examines the components, architecture and functionality of the CPU. This will include the Fetch-Decode Execute Cycle.

Memory & Storage

This examines the different types of memory including RAM, ROM, Cache and Virtual Memory. It also focuses on the different storage technologies used for storing data and the different storage techniques used for text, images and sound. It also looks at the different techniques for representing number including binary and hexadecimal.

Networks

This focuses on how computers are networked together examining types of networks, network topologies and the hardware and cabling necessary for networks. It also examines standards, encryption and common protocols.

Network Security

This examines the main security threats including social engineering, threats from users, malware and threats to large organisations. Security techniques and preventative methods are examined for each potential threat.

Systems Software

This examines the software necessary for running the computer focusing on the operating systems and its functions. It also examines concepts such as backups, utility programs and user interfaces.

Ethics and Legislation

This topic examines the main computing legislation including the Data Protection Act, Computer Misuse Act & the Copyright Designs and Patents Act. It also offers the students a chance to research and debate current issues that impact society including ethical, cultural and environmental issues.

How will I be Assessed?

A variety of assessment methods will be utilised during your study of Computer Science. Formative assessment methods including your ability to explain key terminology, questioning techniques, activities and mini quizzes will be utilised throughout the delivery of each topic. These may be followed by some formal and informal feedback. This will allow both you and I to examine your progress within the topic.

Summative assessments will be used at the end of each topic to ensure a secure understanding of the topic. It is important that you can answer a range of questions at the end of topic that show your knowledge and understanding, your ability to apply that knowledge and your ability to analyse and discuss concepts relating to the topic.

Summative assessments will also include the use of PPE's/mock examinations which take place at three points in the year. These are run in exam conditions and involve sitting a past paper. These can show progress across the year and how well you are able to retain and apply the knowledge from all topics you have studied.

The topic assessments will be carried out within the classroom usually lasting 55 minutes and will be conducted in exam conditions.

PPE's will be carried out in the hall lasting 1 hour 30 minutes in exam conditions.

How will this prepare me for my next steps?

GCSE Computer Science offers you the opportunity to develop a variety of skills which are applicable across the curriculum and will prepare you for further study at A-Level.

Skills that you will develop whilst studying computer science include:

- The ability to think creatively, innovatively, analytically, logically and critically
- Understand and apply the fundamental principles and concepts of computer science, including abstraction, decomposition, logic, algorithms and data representation
- Analyse problems in computational terms through practical experience of problem solving such problems, including designing, writing and debugging programs.
- Understand the components that make up digital systems, and how they communicate with one another and with other systems
- Understand the impacts of digital technology to the individual and a wider society
- Apply mathematical skills relevant to Computer Science and that are transferrable across the curriculum
- The development of subject specific vocabulary and keywords that will enhance literacy across the curriculum
- Ability to discuss ideas in groups, to formulate questions, discuss and summarise
- ability to construct an argument and communicate findings in a clear and persuasive manner, both orally and in writing
- the intellectual rigour and independence to conduct research, to summarise and present findings
- The ability to use a variety of applications and broaden Information Technology skills across the curriculum

Contribution to Studio & UTC Aims

The Studio:

“Our purpose is to prepare you for success in a fast-moving digital world and, in particular, help create opportunities to work or launch businesses in the creative and digital industries. We’ve created an environment to inspire creativity and critical thinking, fed by the industry knowledge of our partners, that lead the sector across the region.”^[1]

Life Sciences UTC:

“Our ethos is simple: we’re committed to providing the highest standards of teaching and learning, combined with real life industry experience which opens doors for our students. Our offer is unique, and we’re proud to work with some of the world-leaders in science and healthcare, giving our students the ability to build a strong and enviable portfolio of experience, so they can hit the ground running once they graduate from our UTC.”^[2]

Computer Science supports the ethos of both the Studio and Life Sciences UTC. The course requires both academic rigor and practical application. Students are encouraged to think creatively and to develop the skills necessary to design, implement and test programs which can be applied in industry. We have strong links with academic partners, we encourage enrichment activities that can complement and enhance their subject experience and as they progress into sixth form we have links with businesses offering degree apprenticeships.

Career Planning

The GCSE Computer Science course leads directly into several courses within our sixth form provision which are:

- Games Programming
- A Level Computer Science
- Cambridge Technical Level 3 IT

After this, students may wish to progress onto university or a degree apprenticeship

Typical Jobs related to Computer Science include:

- Cyber Security
- Programmer
- Software Developer
- Network Engineer
- IT Technician
- Robotics
- Games Designer
- Web Developer
- Social Media Manager
- App developer

^[1] <https://thestudioliverpool.uk/who-we-are/about-us-and-ethos-2/>

^[2] <https://lifesciencesutc.co.uk/who-we-are/about-us-and-ethos/>