

**EMMANUEL COLLEGE**  
**THE BUSINESS AND COMPUTING DEPARTMENT**  
 Year 11 Computer Science



Year 11 GCSE Computer Science	Autumn Half Term 1	Autumn, Half Term 2	Spring Term
<b>Unit Title</b>	Producing robust Programs  Network Security	Programming Languages and Integrated Development Environments  Systems Software	Ethical, Legal, Cultural and Environmental Impact
<b>Key Question(s)?</b>	How do we design programs that stand up to deliberate, or accidental, misuse? How do we ensure that programs operate effectively regardless of the data they receive? What vulnerabilities are there in a networked computer system? What measures can be put in place to reduce the vulnerabilities in a computer system?	What different types of programming language are common in use? What are the features of each of these? How are programs written in programming languages converted into binary for execution by a computer? What facilities are available to support a programmer when producing their programs? What software is needed to enable a computer system to run effectively?	What are the ethical, legal and cultural concerns created by the use of complex computer systems?
<b>Threshold Concepts</b>	<p>Defensive design ensures we consider that programs will not always be used by careful users in an appropriate manner.</p> <p>To ensure programs keep on working and doing what users expect of them we need to consider their maintainability.</p> <p>To ensure programs work as expected they must be tested. The purpose of testing is not to show they work with typical data but to prove they will not 'break' if atypical data is entered and to ensure all options work as expected – destructive testing.</p>	<p>There are different levels (generations) of programming languages: machine code (first generation); low level (second generation); high level (third generation); and declarative (fourth generation). Each level has a different purpose and different characteristics in terms of speed of execution, file size, ease of use for programmer, and need for translation.</p> <p>An assembler is a program that converts assembly language into machine code. It takes the basic commands and operations from assembly code (the source code) and converts them into binary code (the executable code).</p>	<p>Ethics are moral principles, or rules, which govern a person's attitudes and behaviour. The ethics of an industry or organisation are often set out in a documented form.</p> <p>Ethical issues in computing include privacy, equality of access to technology (the digital divide), and the impact and responsibilities of social media.</p> <p>Legal issues include ensuring public safety, protecting individuals' intellectual property, protecting individuals' and businesses' computers systems, and security of data. Various legislation has been introduced to ensure these</p>

	<p>A network attack is an attempt to gain access to, steal, modify or delete data on a network. Such attacks distributed denial of service (DDOS) attacks and eavesdropping.</p> <p>There are many techniques that can be used to help keep a network safe, including: penetration testing, anti-malware software, firewalls, user access levels, passwords, encryption, physical security</p>	<p>The way these different pieces of systems software interact with each other and with other applications that may be run on the computer system is a further example of the application of CT methods to enable modern systems to operate.</p>	<p>including the Computer Misuse Act, The Data Protection Act, The Copyright, Designs and Patent Act and software licensing.</p>
<b>Link to Prior Learning</b>	<p>Previously students have learnt how to employ CT to design and build a program. However, creating a program is not the end point; creating an effective and unbreakable program is. This unit builds on the prior units to demonstrate the importance of design to building in features and testing for misuse of a program.</p> <p>The networking of computers has brought many new risks; hence this unit is a logical and essential post-requisite to the networking units.</p>	<p>In the initial units in Year 9 and 10 students came to appreciate that computers process binary. They have since developed their own programming skills in a high-level language. This unit links these two by investigating how programming languages are classified and converted to binary ready for execution.</p>	<p>Students have considered this through the curriculum at Emmanuel but have not yet studied it in-depth and applied their knowledge.</p>
<b>Knowledge and Sequencing Rationale</b>	<p>Programs are not created for the programmer to operate; they are usually created for others to use. These others will often, intentionally and unintentionally, misuse the program and it must withstand this misuse without crashing. Robust design methods, including pre-planned testing, are the first step in ensuring this, hence their inclusion.</p> <p>Until students have enough functional programming skills to develop complex programs it is difficult to make a convincing argument for the need for robust design methods, hence this unit is taught after students have completed and practised their functional programming skills and are ready to start to create and implement more complex programs that need such an approach.</p> <p>This unit is a natural follow-on to the two prior networking units.</p> <p>The way programming languages are classified translated and is another concrete example to computational thinking in action over progressive years within computer science. It is also beneficial for students to appreciate what is happening as programs they have written are executed, and have an appreciation of the implications of the choices of programming language and translator.</p>		

Students need to have studied data representation and programming before they appreciate the need for translators, as this unit is later in the course they will have also been exposed to other forms of language, assembly SQL, which will be beneficial in appreciating the difference between different classifications of language.

Computers are entirely embedded within our world. We use them hourly, if not more regularly, and need to understand that their use is not without impact on our society, at a national and global level, and our environment. This unit gives the opportunity to discuss how computer use impacts different groups, how current systems try to mitigate negative impacts and whether that is enough.

It is intended that students' knowledge of computers, their use and impact developed during this course will give them a broad appreciation of some initial issues pertinent to this unit which can be analysed, evaluated and responded to with the increased maturity they will now have as Year 11 students.

