COMPUTING CURRICULUM MAP

Intent: The Computing department at UTC Heathrow aims to equip students to participate in a rapidly changing world through challenging and engaging topics. Students will develop an understanding and application in the fundamental principles of computer science, Information Technologies (IT), and Cybersecurity by having the opportunity to write programs design webpages, apply technical skills gained in cybersecurity and produce professional digital products.   Some of the critical skills include project management, systems analysis, design, and cybersecurity.

Computing and IT skills are a significant factor in enabling children to be confident, creative and independent learners, and we intend that students have every opportunity available to allow them to achieve this.

The national curriculum for Computing aims to ensure that all pupils:

• can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms, and data representation

• can analyse problems in computational terms, and have repeated the practical experience of writing computer programs to solve such problems

• can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems

• are responsible, competent, confident, and creative information and communication technology, users.

In Computer Science, we are dedicated to ensuring our students leave with the skills to embrace a future of rapidly advancing computer technology fully. Apart from the academic curriculum, students will gain key industry skills through

We intend to develop key skills in IT and cybersecurity, which include:

• IT management for business

• Digital technology solutions

• Computer networks and security

• Business computing and entrepreneurship

Year 12 Computer Science (H446)					
Half Term 1	**Half Term 2**	**Half Term 3**	**Half Term 4**	**Half Term 5**	**Half Term 6**
Structure and function of the processor Introduce learners to the internal workings of the Central Processing Unit (CPU) and the types of processors. Learn how different input, output and storage devices can be applied to solutions of different problems. RAM, ROM and virtual storage. **Computational thinking** Understand what is meant by computational thinking and be able to apply the computational thinking methods namely: Thinking ahead, abstractly, procedurally, logically, concurrently. Writing and following algorithms. **Cisco Networking Academy courses, Palo Alto Academy Cybersecurity courses**	**Systems Software** Learn the need for, function and purpose of operating systems. Key elements studied include memory management, interrupts, and scheduling techniques, different types of operating systems, BIOS, device drivers and virtual machines. **Application generation** Study the nature of applications, justifying suitable applications for a specific purpose, utilities, open or closed source applications and translators. Primitive data types, integer, real/floating point, character, string and Boolean **Programming techniques** Learn the programming constructs, recursion, global and local variables. Use of IDE to develop, debug programs and use of OOP **Data structures** Arrays (of up to 3 dimensions), records, lists, tuples. Writing and following algorithms.	**Types of programming language** Learn the need for and characteristics of a variety of programming paradigms. Assembly language programming Learn procedural languages and modes of addressing memory. **Networks** Learn the characteristics of networks and the importance of protocols and standards. Learn the internet structure, network security and threats, use of firewalls, proxies and encryption. Programming Development (Graphical user interface - GUI) **Programming techniques** Learn the programming constructs, recursion, global and local variables. Use of IDE to develop, debug programs and use of OOP **January Mock examinations**	**Types of programming language** Object-oriented languages with an understanding of classes, objects, methods, attributes, inheritance, encapsulation, and polymorphism **Compression, Encryption and Hashing** Understand lossy vs lossless compression, encoding techniques, symmetric and asymmetric encryption as well as different uses of hashing. **Computational methods** Features that make a problem solvable by computational methods, Problem recognition, decomposition, use of divide and conquer and abstraction. Learners apply their knowledge of backtracking, data mining, heuristics, performance modelling, pipelining, and visualisation to solve problems. **Data structures** Learn the following data structures arrays, records, tuples, linked-list, graph, stack, queue, tree, binary search tree, hash table. **Cisco Networking Academy courses, Palo Alto Academy Cybersecurity courses**	**Software development** Understand the waterfall lifecycle, agile methodologies, extreme programming, the spiral model and rapid application development. The relative merits and drawbacks of different methodologies and when they might be used. Different test strategies, including black and white box testing and alpha and beta testing **Databases** Learn flat file and relational databases and terminology applied to them namely: entity relationship modelling, normalisation, SQL, referential integrity and transaction processing. **Programming project** lessons (Analysis, design and development) **Cisco Networking Academy courses, Palo Alto Academy Cybersecurity courses**	**Programming project** Learn analysis of the Learn, analysis of the problem and apply in their projects (Problem Identification, stakeholders, research problem and specify the proposed solution. Learn the design if the solution which includes problem decomposition, describe the solution and describe the approach to testing. Programming development **Programming project progression** **End of Mock examinations Revision** **End of Mock examinations** **Cisco Networking Academy courses, Palo Alto Academy Cybersecurity courses**

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Year 13 Computer Science (H446)					
Half Term 1	**Half Term 2**	**Half Term 3**	**Half Term 4**	**Half Term 5**	**Half Term 6**
Data types Represent positive in binary and hexadecimal. Use of sign and magnitude and two's complement to represent negative numbers in binary. Representation and normalisation of floating-point numbers in binary. Bitwise manipulation and masks: shifts, combining with AND, OR, and XOR. How character sets (ASCII and UNICODE) are used to represent text. **Moral and ethical issues** The individual moral, social, ethical and cultural Opportunities and risks of digital technology. **Programming project progression** Iterative Development Process. Testing to inform development **Programming project progression** Programming project deadline for the analysis stage	**Boolean Algebra** Define problems using Boolean logic. Manipulate Boolean expressions, including the use of Karnaugh maps to simplify Boolean expressions. Learn to derive or simplify statements in Boolean algebra using De Morgan's Laws, distribution, association, commutation, double negation. Using logic gate diagrams and truth tables. The logic associated with D type flip flops, half and full adders. **Computing related legislation** The Data Protection Act 1998. The Computer Misuse Act 1990. The Copyright Design and Patents Act 1988. The Regulation of Investigatory Powers Act 2000. **Programming project progression** Programming project deadline for design stage November Mock examinations	**Programming project progression** **Web technologies** Learn HTML and CSS, search engine indexing and PageRank algorithm. Server and client-side processing. **Revision sessions**	**March Mock examinations** **Revision sessions** **Programming project deadline** **final submission**	**Final A2 exams** **Revision sessions**	**Final** **A2 examinations** **Revision sessions**

Impact: To ensure that all students make significant progress, through continual formative and summative assessments. The assessments will feed into the tracker and teaching and interventions will be affected accordingly to enhance knowledge and understanding. Progress is tracked through central records and classroom teachers will adapt their teaching accordingly.

Pupil engagement in homework, end of topic tests and intervention is also closely monitored with parents/guardians kept up to date through regular contact. Through the curriculum, we aim to develop in our students' an appreciation of computing, IT and cybersecurity and a sense of enjoyment and curiosity for the subject. The success of this will be monitored at the end of Year 11, Year 13 with the external exams and internal assessments in IT. On successful completion of these studies at KS5, hope to have developed confident students who will be able to partake relevant apprenticeships or university.

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Transforming lives through learning