

Curriculum Plans: Year 13 (Computer Science)

	Topic	Knowledge: By the end of the unit students will know:	Skills: What skills will students have developed by the end of this unit?	Key terms: What new key terms and vocabulary will be learnt in this unit?	Summative Assessment: How will pupils be assessed in this unit?
Term 1	SLR10 Databases	<ul style="list-style-type: none"> Understanding the concept of relational databases and their structure. The importance and role of primary keys, foreign keys, and relationships in a database. Normalization and its purpose in reducing data redundancy and improving efficiency. Different methods for capturing, selecting, managing, and exchanging data in databases. Understanding SQL and how it is used to retrieve, insert, update, and delete data. The differences between flat file and relational databases. The importance of referential integrity and how it maintains consistency in databases. The concept of ACID properties in transaction processing and their role in maintaining data integrity. 	<ul style="list-style-type: none"> Creating and interpreting entity relationship diagrams (ERD) for multiple entities. Defining primary and foreign keys and using them to establish relationships between tables. Normalizing a database to 1NF, 2NF, and 3NF to ensure efficient data storage and retrieval. Capturing, storing, and exchanging data effectively using SQL and other data management tools. Writing SQL queries to retrieve and manipulate data in relational databases. Comparing the pros and cons of flat file and relational database structures. 	<ul style="list-style-type: none"> Relational Database Primary Key Foreign Key Normalisation 1NF 2NF 3NF Entity, Attribute Record Field SQL (Structured Query Language) Flat File Table Record Referential Integrity ACID (Atomicity, Consistency, Isolation, Durability) 	Written Assessment – End of topic test with MCQ on MS Forms

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			<ul style="list-style-type: none"> Ensuring referential integrity is maintained by properly managing primary and foreign keys. Explaining how the ACID properties (Atomicity, Consistency, Isolation, Durability) ensure database reliability. 		
Term 1	SLR13 Data types	<ul style="list-style-type: none"> Understanding different data types: integers, floats, doubles, Booleans, characters, and strings. The use of arrays, records, and pointers in data management. Understanding the difference between constants and variables in programming. The importance of type casting and its role in converting between data types. Recognizing overflow and how it affects the accuracy of data in binary calculations. Understanding two's complement and its role in representing negative numbers in binary. Knowledge of character sets, such as ASCII and Unicode, and their use in representing text. 	<ul style="list-style-type: none"> Identifying and applying appropriate data types for various variables in a program. Creating arrays and records to store multiple data values and manipulating them efficiently. Declaring and using constants and variables within code, applying correct scope and lifetime rules. Performing type casting between different data types (e.g., integer to float) as needed in programs. Performing binary arithmetic and detecting overflow 	<ul style="list-style-type: none"> Integer Real Float Double Boolean Character String Array Record Pointer Constant Variable Type Casting Overflow Two's Complement, Sign and Magnitude ASCII Unicode 	Written Assessment – End of topic test with MCQ on MS Forms

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		<ul style="list-style-type: none"> Floating point binary representation and its use in handling real numbers in computing. - The process of normalizing floating-point numbers to ensure precision in calculations. 	<p>conditions in binary calculations.</p> <ul style="list-style-type: none"> Converting between binary and denary using two's complement for negative numbers. Encoding and decoding text using character sets, such as ASCII and Unicode. Converting between floating point binary and denary, handling positive and negative exponents. Normalising floating-point binary numbers to maintain accuracy and avoid underflow and overflow. 	<ul style="list-style-type: none"> Floating Point Binary 	
Term 1	SLR11 Networks	<ul style="list-style-type: none"> Understanding different types of networks: LAN, WAN, PAN, and their characteristics. Knowledge of different network topologies (bus, star, ring, mesh) and their advantages/disadvantages. The purpose and function of network hardware such as routers, switches, hubs, and modems. 	<ul style="list-style-type: none"> Distinguishing between LAN, WAN, and PAN, and identifying their use cases. Creating and interpreting diagrams for various network topologies. Identifying and explaining the role of different network devices in connecting systems. 	<ul style="list-style-type: none"> Local Area Network (LAN) Wide Area Network (WAN) Personal Area Network (PAN) Topology Bus Star Ring Mesh Router 	Written Assessment – End of topic test with MCQ on MS Forms

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		<ul style="list-style-type: none"> • The function of IP and MAC addresses in network communication. • The role of DNS, DHCP, and NAT in network management and addressing. • Understanding network protocols (TCP/IP, HTTP, HTTPS, FTP, SMTP, IMAP, etc.) and their applications. • The concepts of packet switching and circuit switching in data transmission. • Security threats to networks, such as viruses, phishing, DOS/DDOS attacks, and data interception. • The importance of bandwidth, latency, and network performance measures. • - Understanding client-server and peer-to-peer network models and their differences. 	<ul style="list-style-type: none"> • Differentiating between IP addresses and MAC addresses and explaining their roles in a network. • Explaining how DNS resolves domain names and how DHCP assigns IP addresses dynamically. • Using network protocols to establish communication between devices in different network environments. • Explaining how data is transmitted across networks using packet switching and circuit switching. • Identifying and mitigating network security risks using encryption, authentication, and firewalls. • Analyzing how bandwidth and latency impact network performance in different scenarios. 	<ul style="list-style-type: none"> • Switch • Hub • Modem • IP Address • MAC Address • DNS (Domain Name System) • DHCP (Dynamic Host Configuration Protocol) • NAT (Network Address Translation) • TCP/IP • HTTP, HTTPS, • FTP, SMTP, • IMAP • Packet Switching • Circuit Switching • Encryption • Authentication • Firewall • Bandwidth • Latency • Client-Server • Peer-to-Peer (P2P) 	
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			<ul style="list-style-type: none"> - Comparing the pros and cons of client-server vs. peer-to-peer networks in various setups. 		
Term 2	SLR16 Computer related legislation	<ul style="list-style-type: none"> Understanding key pieces of legislation relevant to computer science, including the Data Protection Act, Computer Misuse Act, and Copyright Designs and Patents Act. The impact of the General Data Protection Regulation (GDPR) on personal data handling and sharing. The role of intellectual property laws in protecting software, creative works, and innovations. Understanding the ethical implications of data collection, surveillance, and online tracking. The legal and ethical challenges posed by cybercrime and unauthorized access. The role of Digital Rights Management (DRM) in protecting digital content and preventing piracy. 	<ul style="list-style-type: none"> Applying legislation knowledge to real-world scenarios involving privacy, intellectual property, and cybercrime. Identifying and protecting personal data in line with GDPR requirements. Evaluating the impact of intellectual property laws on software development and distribution. Assessing the ethical impact of data collection methods on privacy and security. Recognizing and mitigating risks of cybercrime, including hacking and phishing. Applying DRM technologies to protect software, music, and video from 	<ul style="list-style-type: none"> Data Protection Act GDPR Intellectual Property, Copyright, Patents, Trademarks Regulation of Investigatory Powers Act (RIPA) Computer Misuse Act Digital Rights Management (DRM) Whistleblowing - Software Licensing, Open Source, Proprietary Software 	

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		<ul style="list-style-type: none"> • The purpose and scope of whistleblowing laws and how they apply to unethical practices in organizations. • - Software licensing models and their legal implications for software use and distribution. 	<p>unauthorized distribution.</p> <ul style="list-style-type: none"> • Understanding how whistleblowing policies protect employees who expose illegal or unethical practices. • - Differentiating between open-source and proprietary software licenses and their usage conditions. 		
Term 2	SLR17 Ethical, moral and cultural issues	<ul style="list-style-type: none"> • Understanding the ethical, moral, and cultural issues surrounding the use of computer technology, including automation, AI, and online privacy. • The impact of automated decision-making systems on individuals' rights and freedoms. • Ethical implications of artificial intelligence (AI) in the workforce, such as job displacement and bias in AI systems. • Cultural differences in the perception of technology, such as censorship, privacy, and internet regulation. • Environmental effects of computer technology, 	<ul style="list-style-type: none"> • Analyzing real-world scenarios to identify the ethical, moral, and cultural issues involved in the use of technology. • Explaining how automated systems affect personal data rights, including the implications of the Data Protection Act. • Debating the benefits and drawbacks of AI in various fields, such as healthcare, finance, and transportation. • Researching and discussing how different countries implement internet 	<ul style="list-style-type: none"> • Ethics • Morality • Culture • Automated Decision-Making • Data Protection Act • Artificial Intelligence (AI) • Bias • Automation • Censorship • Privacy • Internet Regulation • E-Waste • Environmental Impact • Surveillance • Monitoring 	Written Assessment – Essay Question with MCQ on MS Forms

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		<p>including resource consumption, energy usage, and e-waste.</p> <ul style="list-style-type: none"> • The role of computer technology in monitoring behavior, such as the use of CCTV, traffic cameras, and online tracking. • Legal and ethical issues in data collection and targeted advertising based on personal data. • - The challenges posed by the rapid development of technology, including piracy, offensive communications, and access to information. 	<p>ensorship and the cultural reasons behind it.</p> <ul style="list-style-type: none"> • Assessing the environmental impact of technology, including energy consumption, waste management, and recycling. • Evaluating the ethical implications of using technology for surveillance and monitoring in public and private spaces. • Discussing the legal responsibilities and ethical dilemmas of companies collecting and using personal data for marketing. • - Identifying how laws such as the Computer Misuse Act and Copyright Designs and Patents Act apply to modern technological challenges. 	<ul style="list-style-type: none"> • Targeted Advertising • Data Collection • Piracy • Offensive Communications • Copyright 	
Term 3	SLR14 Data structures (revision)	<ul style="list-style-type: none"> • Understanding different data structures: arrays, lists, linked lists, stacks, queues, and graphs. 	<ul style="list-style-type: none"> • Implementing basic data structures such as arrays, stacks, queues, and linked lists in programming. 	<ul style="list-style-type: none"> • Array • List • Linked List • Static Data Structure 	

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		<ul style="list-style-type: none"> • Differences between static and dynamic data structures and their respective use cases. • Operations on queues and stacks, including enqueue, dequeue, push, pop, and peek. • Understanding linked lists and their advantages in dynamic memory allocation. • Trees and binary search trees (BST): insertion, deletion, and traversal (in-order, pre-order, post-order). • The role and application of hash tables in efficient data storage and retrieval. • - Understanding graph data structures, including directed and undirected graphs, adjacency lists, and matrices. 	<ul style="list-style-type: none"> • Distinguishing between static and dynamic data structures based on their behavior during runtime. • Writing programs to perform common operations on queues and stacks (FIFO and LIFO structures). • Traversing and manipulating linked lists, including adding and removing nodes. • Implementing binary trees and performing traversal operations such as in-order, pre-order, and post-order. • Creating and using hash tables for fast data lookup and handling collisions using methods like chaining. • - Implementing and traversing graph data structures using breadth-first and depth-first search algorithms. 	<ul style="list-style-type: none"> • Dynamic Data Structure • Stack • Queue • LIFO (Last In First Out) • FIFO (First In First Out) • Node • Pointer • Linked List • Binary Tree • Binary Search Tree (BST) • Traversal • Hash Table • Hash Function • Collision • Graph • Directed Graph • Undirected Graph • Adjacency List • Adjacency Matrix 	
Term 3	Revision based on student needs				