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Curriculum Plan

KS5 – Computer Science

Year 13

Golden Threads

How to use computational methods to create algorithms solve problems
How to use a high-level programming language to turn algorithms into runnable code
What are the fundamental principles behind how computers operate?
How to analyse, design, develop, test and evaluate a project

Enrichment

Review and Evaluation

	Topics & Substantive Knowledge	Disciplinary Knowledge	Assessment	Misconceptions	Key Vocabulary	Knowledge Tracking
Term 1	2.2.2 Computational methods a) Features that make a problem solvable by computational methods. (b) Problem recognition. (c) Problem decomposition. (d) Use of divide and conquer. (e) Use of abstraction. (f) Learners should apply their knowledge of: • backtracking • data mining • heuristics • performance modelling • pipelining • visualisation to solve problems.		Week 6 - Exam question based assessment		Backtracking Data mining Halting problem Heuristics Intractable problems Pipelining Problem abstraction Simulation Unsolvable problem	Links to: 2.1 2.3.1
	1.3.4 Web Technologies (b) Search engine indexing. (c) PageRank algorithm. (d) Server and client side processing.	(a) HTML, CSS and JavaScript.			API Back end Clients Client-to-server Cloud computing Compiler Crawling CRUD CSS Dynamic website Front end HTML Hyperlink Inbound link Indexing Internet Interpreter JavaScript JSON Mashup Metadata model Outbound links PageRank Peer-to-peer PHP Python REST Scripts Server Static website Web application Web browser Web crawler Web page WebSocket protocol XML	Links to: 1.2.2 1.2.4 1.3.3 2.2.1

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	Topics & Substantive Knowledge	Disciplinary Knowledge	Assessment	Misconceptions	Key Vocabulary	Knowledge Tracking
Term 2	1.3.3 Networks (a) Characteristics of networks and the importance of protocols and standards. (b) The internet structure: • The TCP/IP Stack. • DNS • Protocol layering. • LANs and WANs. • Packet and circuit switching. (c) Network security and threats, use of firewalls, proxies and encryption. (d) Network hardware. (e) Client-server and peer to peer.		Week 6 - Exam question based assessment	How important protocols are to ensure device interoperability	Acknowledgement Bridges Bus network Circuit switching CSMA/CA CSMA/CD Cyclic redundancy check Data frame Data packet Dynamic host control protocol Encapsulation Ethernet FTP Full mesh network Gateway Handshaking HTTP Hubs IMAP IP address IPv4 IPv6 LAN Layering MAC address Mail server Malware MAN Modem Network Network Interface Card Packet switching PAN Partial mesh network POP3 Port Port forwarding Protocols Ring network Router Routing Routing table SAN SMTP Socket SSH SSID Star network Subnetting Switches TCP/IP Topology VoIP VPN WAN Wi-Fi Wireless Access Points Wireless Network Adaptor WPA2 WPAN	Links to: 1.3.2
	2.1.5 Thinking concurrently a) Determine the parts of a problem that can be tackled at the same time. (b) Outline the benefits and trade offs that might result from concurrent processing in a particular situation.			It is easy to write software that does several different things at the same time		

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Term 2 (continued)

Topics & Substantive Knowledge	Disciplinary Knowledge	Assessment	Misconceptions	Key Vocabulary	Knowledge Tracking
1.4.1 Data Types (a)Primitive data types, integer, real/floating point, character, string and Boolean. (j) How character sets (ASCII and UNICODE) are used to represent text.	(b) Represent positive integers in binary. (c) Use of sign and magnitude and two's complement to represent negative numbers in binary. (d) Addition and subtraction of binary integers. (e) Represent positive integers in hexadecimal. (f) Convert positive integers between binary hexadecimal and denary. (g) Representation and normalisation of floating point numbers in binary (h) Floating point arithmetic, positive and negative numbers, addition and subtraction. (i) Bitwise manipulation and masks: shifts, combining with AND, OR, and XOR.	Week 6 - Exam question based assessment	That characters etc. are stored differently in RAM to numbers	AND ASCII Assembly language Binary Bit Byte Character set Denary Exponent (p) Extended ASCII Firewall Fixed-point system Floating point numbers Integers MAC address Machine code Mantissa (m) Memory dump normalisation NOT OR overflow error RGB colour model Router sign bit two's complement UAA underflow error Unicode URL XOR	Links to: 1.1 1.2.1 1.2.4

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	Topics & Substantive Knowledge	Disciplinary Knowledge	Assessment	Misconceptions	Key Vocabulary	Knowledge Tracking
Term 3	1.4.2 Data Structures (a) Arrays (of up to 3 dimensions), records, lists, tuples (b) The following structures to store data: linked-list, graph (directed and undirected), stack, queue, tree, binary search tree, hash table.	(c) How to create, traverse, add data to and remove data from the data structures mentioned above.	Mock exams for Paper 1 and Paper 2		Adjacency list Adjacency matrix Array Binary search tree Binary tree Call Stack Collision Data Structure Declaration Dictionary Directed graph Dynamic Front Graph Hash table Hashing Head Homogenous Leaf Linear Linked list Lists Local variable nextFree Node Non-Homogeneous Non-Linear Overflow error Pointer Pointer Queue Rear Record Rehashing Return address Stack Subtree Synonyms Top Traversal Tree Underflow error Undirected graph	Links to 2.3.1

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	Topics & Substantive Knowledge	Disciplinary Knowledge	Assessment	Misconceptions	Key Vocabulary	Knowledge Tracking
Term 3 (continued)	1.3.1 Compression, Encryption and Hashing (a) Lossy vs Lossless compression. (b) Run length encoding and dictionary coding for lossless compression. (c) Symmetric and asymmetric encryption. (d) Different uses of hashing.		Mock exams for Paper 1 and Paper 2		Binary tree Bit depth Bitrate Codec Compression Digital certificates Digital signatures Encryption GIF HD video Hash function Hash total Huffman coding JPEG Lossless compression Lossy compression MP3 PNG Resolution Run-Length Encoding Sampling WAV	

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	Topics & Substantive Knowledge	Disciplinary Knowledge	Assessment	Misconceptions	Key Vocabulary	Knowledge Tracking
Term 4	2.3.1 Algorithms (a) Analysis and design of algorithms for a given situation. (b) The suitability of different algorithms for a given task and data set, in terms of execution time and space. (c) Measures and methods to determine the efficiency of different algorithms, Big O notation (constant, linear, polynomial, exponential and logarithmic complexity). (d) Comparison of the complexity of algorithms. Exam preparation	(e) Algorithms for the main data structures, (stacks, queues, trees, linked lists, depth-first (post-order) and breadth-first traversal of trees). • Stacks • Queues • Trees • Linked lists • Depth-first (post order) traversal of trees • Breadth-first traversal of trees	Week 6 - Exam question based assessment		Array A* algorithm Adjacency list Algorithm Back-tracking Big-O notation Binary search algorithm Binary search tree Breadth-first traversal Bubble sort Depth-first traversal Dijkstra's algorithm Divide and conquer approach Front Graph Heuristics Insertion sort Iteration Linear search algorithm Lists Merge sort Ordered list Permutation Priority queue Program Pseudocode Queue Quicksort Sorting algorithm Space measure Split point Stack Time measure Traversal Tree Undirected graph	
Term 5	Exam preparation					