

Curriculum Map 2020-2021

Subject: Computing

Term 1 Aug-Oct

Year 12 Computer Science	Unit title	P1 - Introduction to programming (including data structures and structured design)	
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Understand the concept of a data type • Understand and use the following appropriately: <ul style="list-style-type: none"> o integer o real/float o Boolean o character o string o date/time o pointer/reference o records (or equivalent) o arrays (or equivalent) • Define and use user-defined data types based on language-defined (built-in) data types • Use, understand and know how the following statement types can be combined in programs: <ul style="list-style-type: none"> o variable declaration o constant declaration o assignment o iteration o selection o subroutine (procedure/function) • Use definite and indefinite iteration, including indefinite iteration with the condition(s) at the start or the end of the iterative structure • A theoretical understanding of condition(s) at either end of an iterative structure is required, regardless of whether they are supported by the language being used 	

- Use nested selection and nested iteration structures
- Use meaningful identifier names and know why it is important to use them
- Be familiar with and be able to use:
 - o addition
 - o subtraction
 - o multiplication
 - o real/float division
 - o integer division, including remainders
 - o exponentiation
 - o rounding
 - o truncation
- Be familiar with and be able to use:
 - o equal to
 - o not equal to
 - o less than
 - o greater than
 - o less than or equal to
 - o greater than or equal to
- Be familiar with and be able to use:
 - o NOT
 - o AND
 - o OR
 - o XOR
- Be able to explain the differences between a variable and a constant
- Be able to explain the advantages of using named constants
- Be familiar with and be able to use:
 - o length
 - o position
 - o substring
 - o concatenation
 - o character → character code
 - o character code → character
 - o string conversion operations

		<ul style="list-style-type: none"> • Be familiar with, and be able to use, random number generation • Be familiar with the concept of exception handling • Know how to use exception handling in a programming language with which students are familiar • Be familiar with subroutines and their uses • Know that a subroutine is a named 'out of line' block of code that may be executed (called) by simply writing its name in a program statement • Be able to explain the advantages of using subroutines in programs • Be able to describe the use of parameters to pass data within programs • Be able to use subroutines with interfaces • Be able to use subroutines that return values to the calling routine • Know that subroutines may declare their own variables, called local variables, and that local variables: <ul style="list-style-type: none"> o exist only while the subroutine is executing o are accessible only within the subroutine • Be able to use local variables and explain why it is good practice to do so • Be able to contrast local variables with global variables • Be able to explain how a stack frame is used with subroutine calls to store: <ul style="list-style-type: none"> o return addresses o parameters o local variables 	
	Further learning		
	Other information	Some content will need face-to-face teaching and software available in school, (can't guarantee students have access at home).	
Year 12 BTEC IT	Unit title	U6: LAA Website principles and U2: Database structures	

	Personalised Learning Checklist	<ul style="list-style-type: none"> • Compare the principles of website design used in two websites, including their suitability for the intended audience and intended purpose. • Analyse how the principles of website design are used to produce creative, high performance websites which meet client requirements. • Evaluate how the principles of website design are used to produced creative, high performance websites which meet client requirements 	<ul style="list-style-type: none"> • Types of relational database management systems (RDBMS) and their characteristics. • RDBMS based on relational models: • relational data structures – relation, attribute, domain, tuple, cardinality and • relational database • relational algebra sets – symbols, union, intersect, join, select • database relations – entity relationship, generic, semantic • relational keys – super key, candidate key, primary key, foreign key integrity constraints – entity integrity, referential integrity • entity relationships – one-to-one, one-to-many, many-to-many. • Use of RDBMS software tools and structured query language (SQL) for defining, <ul style="list-style-type: none"> o modifying and removing data structures and data: o updating, inserting, deletion o retrieval of data for queries, reports o administration of users o security, integrity, recovery. • The role of normalisation to develop efficient data structures: <ul style="list-style-type: none"> o anomalies – update, insertion, deletion o primary keys, foreign keys, composite keys o indexing o referential integrity o data dictionary – tables, fields, data types, validation o cascading update o deletion techniques o joins, unions, intersects o stages of normalisation: <ul style="list-style-type: none"> ▪ un-normalised form (UNF) ▪ first normal form (1NF) ▪ second normal form (2NF) ▪ third normal form (3NF).
	Further learning		
	Other information	Some content will need face-to-face teaching and software available in school, (can't guarantee students have access at home).	
Year 13	Unit title	P1 – Languages and P1 - OOP design	

Computer Science			
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Be able to draw and interpret simple state transition diagrams and state transition tables for FSMs with no output and with output (Mealy machines only). • Be familiar with the concept of a set and the following notations for specifying a set: <ul style="list-style-type: none"> o $A = \{1, 2, 3, 4, 5\}$ o or set comprehension: <ul style="list-style-type: none"> o $A = \{x \mid x \in \mathbb{N} \wedge x \geq 1\}$ o where A is the set consisting of those objects x such that $x \in \mathbb{N}$ and $x \geq 1$ is true. • Know that the empty set, $\{\}$, is the set with no elements. • Know that an alternative symbol for the empty set is \emptyset. • Be familiar with the compact representation of a set, for example, the set $\{0^n 1^n \mid n \geq 1\}$. This set contains all strings with an equal number of 0s and 1s. • Be familiar with the concept of: <ul style="list-style-type: none"> o finite sets o infinite sets o countably infinite sets o cardinality of a finite set o Cartesian product of sets. • Be familiar with the meaning of the term: <ul style="list-style-type: none"> o subset o proper subset o countable set. • Be familiar with the set operations: <ul style="list-style-type: none"> o membership o union o intersection o difference. 	<ul style="list-style-type: none"> • Understand the characteristics of the procedural and object-oriented programming paradigms, and have experience of programming in each • Be familiar with the concepts of: <ul style="list-style-type: none"> o class o object o instantiation o encapsulation o inheritance o aggregation o association aggregation o composition aggregation o polymorphism o overriding • Know why the object-oriented paradigm is used • Be aware of the following object-oriented design principles: <ul style="list-style-type: none"> o encapsulate what varies o favour composition over inheritance o program to interfaces, not implementation • Be able to write object-oriented programs • Be able to draw and interpret class diagrams

		<ul style="list-style-type: none"> • Know that a regular expression is simply a way of describing a set and that regular expressions allow particular types of languages to be described in a convenient shorthand notation. • Be able to form and use simple regular expressions for string manipulation and matching. • Be able to describe the relationship between regular expressions and FSMs. • Know that a language is called regular if it can be represented by a regular expression. • Context-free languages • Backus-Naur Form (BNF)/syntax diagrams 	
	Further learning		
	Other information	Some content will need face-to-face teaching and software available in school, (can't guarantee students have access at home).	
Year 13 BTEC IT	Unit title	U3: LAB Using Social media and U1: Digital device & Transmitting data	
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Explain the different ways in which a business can use social media. • Explain the audience profiles of different social media websites. • Assess the different ways in which a business can use social media to attract a target audience. • Evaluate the business use of social media to interact with customers and promote products or services to a target audience. 	<ul style="list-style-type: none"> • Digital devices that form part or all of IT systems: <ul style="list-style-type: none"> o multifunctional devices o personal computers o mobile devices o servers o entertainment systems o digital cameras – still, video o navigation systems o data capture and collection systems o communication devices and systems. • The function and use of digital devices for: <ul style="list-style-type: none"> o education and training o personal o social o retail o organisational use – business operations, internal and external dissemination of information creative tasks. • Peripheral devices used with other digital devices to form part of an IT system: <ul style="list-style-type: none"> o input devices

			<ul style="list-style-type: none"> o output devices o storage devices. • Manual and automatic data processing. • Accessibility devices. • Characteristics and implications of storage media used to form part of an IT system.
	Further learning		
	Other information	Some content will need face-to-face teaching and software available in school, (can't guarantee students have access at home).	

		Term 2 (Nov - Dec)
Year 12 Computer Science	Unit title	P2 – Computer systems
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Understand the relationship between hardware and software and be able to define the terms hardware and software. • Explain what is meant by system and application software • Understand the need for, and attributes of, different types of software. • Understand the need for, and functions of the following system software: operating systems, utilities, libraries, translators • Understand that a role of the operating system is to hide the complexities of the hardware. • Know that the OS handles resource management, managing hardware to allocate processors, memories and I/O devices among competing processes. • Show awareness of the development of types of programming languages and their classification into low-and high-level languages. • Know that low-level languages are considered to be machine code and assembly language. • Know that high-level languages include imperative high-level language. • Describe machine-code language and assembly language. • Understand the advantages and disadvantages of machine-code and assembly language programming compared with high-level language programming. • Explain the term ‘imperative high-level language’ and its relationship to low-level languages.
	Further learning	
	Other information	

<p>Year 12 BTEC IT</p>	<p>Unit title</p> <p>Personalised Learning Checklist</p>	<p>U6: LAB Website development and U2: Database processing</p> <ul style="list-style-type: none"> • Produce website designs that meet client requirements • Review design proposals with others to inform improvements • Produce a website for an intended audience and purpose • Review the extent to which the website meets client needs • Optimise a website to meet client needs <ul style="list-style-type: none"> • Types of relational database management systems (RDBMS) and their characteristics. • RDBMS based on relational models: <ul style="list-style-type: none"> • relational data structures – relation, attribute, domain, tuple, cardinality and • relational database • relational algebra sets – symbols, union, intersect, join, select • database relations – entity relationship, generic, semantic • relational keys – super key, candidate key, primary key, foreign key integrity constraints – entity integrity, referential integrity • entity relationships – one-to-one, one-to-many, many-to-many. • Use of RDBMS software tools and structured query language (SQL) for defining, <ul style="list-style-type: none"> ○ modifying and removing data structures and data: ○ updating, inserting, deletion ○ retrieval of data for queries, reports ○ administration of users ○ security, integrity, recovery. • The role of normalisation to develop efficient data structures: <ul style="list-style-type: none"> ○ anomalies – update, insertion, deletion ○ primary keys, foreign keys, composite keys ○ indexing ○ referential integrity ○ data dictionary – tables, fields, data types, validation ○ cascading update ○ deletion techniques ○ joins, unions, intersects ○ stages of normalisation: <ul style="list-style-type: none"> ▪ un-normalised form (UNF) 	
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			<ul style="list-style-type: none">▪ first normal form (1NF)▪ second normal form (2NF)▪ third normal form (3NF).
	Further learning		
	Other information		

Year 13 Computer Science	Unit title	P1 – Databases	
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Produce a data model from given data requirements for a simple scenario involving multiple entities. • Produce entity relationship diagrams representing a data model and entity descriptions in the form: Entity1 (Attribute1, Attribute2,). • Explain the concept of a relational database. • Be able to define the terms: <ul style="list-style-type: none"> ○ attribute ○ primary key ○ composite primary key ○ foreign key. • Normalise relations to third normal form. • Understand why databases are normalised. • Be able to use SQL to retrieve, update, insert and delete data from multiple tables of a relational database. • Be able to use SQL to define a database table. • Know that a client server database system provides simultaneous access to the database for multiple clients. <p>Know how concurrent access can be controlled to preserve the integrity of the database.</p>	
	Further learning		
	Other information		
Year 13 BTEC IT	Unit title	U3: LAB Using Social media and U1: Systems	
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Explain the different ways in which a business can use social media. • Explain the audience profiles of different social media websites. • Assess the different ways in which a business can use social media to attract a target audience. • Evaluate the business use of social media to interact with customers and promote products or services to a target audience. 	<ul style="list-style-type: none"> • Wireless and wired methods of connecting devices and transmitting data within and between IT systems • How the features of connection types can meet the needs of individuals and organisations. • The implications of selecting and using different connection types. • The impact of connection types on the performance of an IT system. • The features, use and purpose of different networks: <ul style="list-style-type: none"> ○ personal area network (PAN) ○ local area network (LAN) ○ wide area network (WAN) ○ virtual private network (VPN). • Factors affecting the choice of network: <ul style="list-style-type: none"> ○ user experience – ease of use, performance, availability, accessibility ○ user needs ○ specifications ○ connectivity ○ cost ○ efficiency ○ compatibility ○ implementation: timescales, testing, downtime ○ productivity ○ security. <ul style="list-style-type: none"> • How the feat

			<ul style="list-style-type: none"> • How the features of a network and its component parts affect the performance of an IT system. • Protocols used to govern and control data transmission for common tasks: o email o voice and video calls over the internet o web pages o secure payment systems • Security issues and considerations when transmitting data over different connection types and networks. • Factors affecting bandwidth and latency. • The implications of bandwidth and latency on the use and performance of an IT system • Types of compression: o lossy o lossless. • The applications and implications of data compression. • The use and implications of codecs when using and transmitting audio and video in digital format.
	Further learning		
	Other information		

		Term 3 (Jan - Feb)
Year 12 Computer Science	Unit title	P2 – Data representation
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Be familiar with the concept of a natural number and the set \mathbb{N} of natural numbers (including zero). • Be familiar with the concept of an integer and the set \mathbb{Z} of integers. • Be familiar with the concept of a rational number and the set \mathbb{Q} of rational numbers, and that this set includes the integers. • Be familiar with the concept of an irrational number. • Be familiar with the concept of a real number and the set \mathbb{R} of real numbers, which includes the natural numbers, the rational numbers, and the irrational numbers. • Be familiar with the concept of ordinal numbers and their use to describe the numerical positions of objects. • Be familiar with the use of: <ul style="list-style-type: none"> o natural numbers for counting o real numbers for measurement. • Be familiar with the concept of a number base, in particular: <ul style="list-style-type: none"> o decimal (base 10) o binary (base 2) o hexadecimal (base 16). • Convert between decimal, binary and hexadecimal number bases. • Be familiar with, and able to use, hexadecimal as a shorthand for binary and to understand why it is used in this way. • Know that: <ul style="list-style-type: none"> o the bit is the fundamental unit of information o a byte is a group of 8 bits. • Know that the 2^n different values can be represented with n bits. • Know the names, symbols and corresponding powers of 10 for the decimal prefixes: <ul style="list-style-type: none"> o kilo, k - 10^3 o mega, M - 10^6 o giga, G - 10^9 o tera, T - 10^{12} • Know the difference between unsigned binary and signed binary. • Know that in unsigned binary the minimum and maximum values for a given number of bits, n, are 0 and $2^n - 1$ respectively. • Know that signed binary can be used to represent negative integers and that one possible coding scheme is two's complement. • represent negative and positive integers in two's complement • perform subtraction using two's complement • calculate the range of a given number of bits, n. • Know how numbers with a fractional part can be represented in fixed point form in binary in a given number of bits.

		<ul style="list-style-type: none"> • Be able to convert for each representation form: <ul style="list-style-type: none"> o decimal to binary of a given number of bits o binary to decimal of a given number of bits.
	Further learning	
	Other information	

Year 12 BTEC IT	Unit title	U6: LAB Website development	
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Produce website designs that meet client requirements • Review design proposals with others to inform improvements • Produce a website for an intended audience and purpose • Review the extent to which the website meets client needs • Optimise a website to meet client needs 	
	Further learning		
	Other information		

Year 13 Y13 Computer Science	Unit title	P1 – Aspects of software development	
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Be aware that before a problem can be solved, it must be defined, the requirements of the system that solves the problem must be established and a data model created. • Be aware that before constructing a solution, the 	

		<p>solution should be designed and specified, for example planning data structures for the data model, designing algorithms, designing an appropriate modular structure for the solution and designing the human user interface.</p> <ul style="list-style-type: none"> • Be aware that the models and algorithms need to be implemented in the form of data structures and code (instructions) that a computer can understand. • Be aware that the implementation must be tested for the presence of errors, using selected test data covering normal (typical), boundary and erroneous data. • Know the criteria for evaluating a computer system. 	
	Further learning		
	Other information		
Year 13 BTEC IT	Unit title	U3: LAB Using Social media	
	Personalised Learning Checklist	<ul style="list-style-type: none"> • Explain the different ways in which a business can use social media. • Explain the audience profiles of different social media websites. • Assess the different ways in which a business can use social media to attract a target audience. • Evaluate the business use of social media to interact with 	

		customers and promote products or services to a target audience.	
	Further learning		
	Other information		