

Year 12

Subject: Computer Science

Half term	Objectives/ enquiry questions	Content	Skills	Assessment
1&2	<p>Algorithms & programs</p> <p>Logical operations</p> <p>Data representation</p> <p>Data structures</p>	<p>This topic covers the basics of algorithms and programming. Students then look into how logical operators assist with the running of a computer. How data is stored and manipulated is covered within the last two topics.</p>	<ul style="list-style-type: none"> ▪ Explain the term algorithm and describe common methods of defining algorithms, including pseudocode, flowcharts and structured English. ▪ Identify and explain the use of constants and variables in algorithms and programs ▪ Describe why the use of self-documenting identifiers, annotation and program layout are important in programs. ▪ Give examples of self-documenting identifiers, annotation and appropriate program layout. ▪ Describe the scope and lifetime of variables in algorithms and programs ▪ Explain the purpose and effect of procedure calling, parameter passing and return, call by reference and call by value. ▪ Identify, explain and use mathematical operations in algorithms, including DIV and MOD. ▪ Describe the characteristics of sorting algorithms: bubble sort and insertion sort. ▪ Explain and apply a linear search algorithm. ▪ Explain and apply the binary search algorithm. ▪ Describe appropriate circumstances for the use of each searching technique. ▪ Follow search and sort algorithms and programs and make alterations to such algorithms. ▪ Write search algorithms and programs. ▪ Analyse a problem using appropriate design approaches ▪ Identify, explain and use sequence, selection and repetition in algorithms and programs. ▪ Identify, explain and use counts and rogue values in algorithms and programs. 	<p>Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions.</p> <p>Homework Homework will be set each week based on current topic being learnt in class.</p>

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			<ul style="list-style-type: none">▪ Follow algorithms and programs involving sequence, selection and repetition and make alterations to such algorithms.▪ Write algorithms and programs involving sequence, selection and repetition to solve nonstandard problems.▪ Identify and explain the nature, use and possible benefits of standard functions, standard modules and user defined subprograms.▪ Select appropriate test data to dry-run a program or algorithm in order to identify possible errors.▪ Identify, use and explain the logical operators AND, OR, NOT and XOR in algorithms and programs▪ Explain data compression and how data compression algorithms are used.▪ Explain the purpose of a given algorithm by showing the effects of test data ▪ Draw truth tables for Boolean expressions consisting of AND, OR, NOT and XOR logical operations.▪ Apply logical operations to combinations of conditions in programming, including clearing registers and masking.▪ Simplify Boolean expressions using Boolean identities and rules. ▪ Explain the terms bit, byte and word.▪ Describe and use the binary number system and the hexadecimal notation as shorthand for binary number patterns.▪ Describe how characters and numbers are stored in binary form.▪ Describe standardised character sets.▪ Describe the following different primitive data types, Boolean, character, string, integer and real.▪ Describe the storage requirements for each data type.▪ Apply binary arithmetic techniques.	
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			<ul style="list-style-type: none"> ▪ Explain the representation of positive and negative integers in a fixed-length store using both two's complement, and sign and magnitude representation. ▪ Describe the nature and uses of floating point form. ▪ State the advantages and disadvantages of representing numbers in integer and floating point forms. ▪ Convert between real number and floating point form. ▪ Describe truncation and rounding and their effect upon accuracy. ▪ Describe, interpret and manipulate data structures including arrays (up to two dimensions) and records. ▪ Describe the manipulation of records and arrays. ▪ Select, identify and justify appropriate data structures for given situations. 	
1&2	Hardware and communication	This topic covers, hardware and communication elements of contemporary computer systems and how they are connected.	<p>By completing this topic, students should be able to identify contemporary computer architecture, types of memory and caching, parallel processing, fetch-execute cycle. They will be able to demonstrate how data can be read from RAM into registers and how associated devices are used for input and output.</p> <ul style="list-style-type: none"> ▪ Learning characteristics of contemporary secondary storage devices will enable students to recommend the suitable storage device for specific situations. Their understanding of importance of networking standards and how protocol enable worldwide communication to take place will let them understand how to troubleshoot network issues and secure networks. 	<p>Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions.</p> <p>Homework Homework will be set each week based on current topic being learnt in class.</p>
1&2	Algorithms and programming using python programing language.	This topic covers, Variables and constants, identifiers, scope of variables, parameters, mathematical operations, sorting, searching, problem analysis and programming constructs.	<p>By completing this topic, students should be able to develop software to solve real life problems, implementing computational concepts in python like scope of constants and variables in algorithms and programs, use of self-documenting identifiers, procedure, parameter passing and return. They will be able to use mathematical operations in algorithms, including DIV and MOD.</p> <p>Use bubble and insertion sort and apply a linear search algorithm in their programs.</p>	<p>Students will complete walk through mocks during the lessons to understand how topic will be assessed using past papers.</p> <p>Homework Homework will be set and students will complete specific programming challenges at home to ensure they continue to practise programing.</p>

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			Explain and apply the binary search algorithm. They will be able analyse a problem using appropriate design Approaches and use concepts like sequence, selection and repetition in algorithms and programs.	
1&2	Data transmission	This topic covers, communication networks, serial and parallel data transmission, their advantages and disadvantages.	By completing this topic, students will know how serial and parallel transmission work, how they are implemented on networks to add data communications, the practical application of data communication concepts like simplex, half duplex and full duplex in the transmission of data. They will know how multiplexing and switching can further utilise network media. It will also look at how Communication networks use TCP/IP to make communication possible on networks and on the internet. It will look at how network collision arise and how network collision detection can be used in dealing collisions on networks.	Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions. Homework Homework will be set each week based on current topic being learnt in class.
1&2	Algorithms and programming using python programming language.	This topic covers, Variables and constants, identifiers, scope of variables, parameters, mathematical operations, sorting, searching, problem analysis and programming constructs.	By completing this topic, students should be able to develop software to solve real life problems, implement computational concepts in python like scope of constants and variables in algorithms and programs, use of self-documenting identifiers, procedure, parameter passing and return. They will be able to use bubble and insertion sort and apply a linear search algorithm in their programs. They will be able analyse a problem using appropriate design approaches and use concepts like sequence, selection and repetition in algorithms and programs.	Students will complete walk through mocks during the lessons to understand how topic will be assessed using past papers. Homework Homework will be set and students will complete specific programming challenges at home to ensure they continue to practise programming.
3&4	Organisation and structure of data Principles of programming Program construction Database systems	Understanding how data is organised and accessed is covered. This will include different access, validation and verification techniques. Different levels of languages will be covered and how to convert them to machine code. Finally to cover databases, how they work and understand the different types of DBs.	<ul style="list-style-type: none"> • Explain the purpose of files in data processing ▪ Define a file in terms of records and fields. ▪ Explain fixed and variable length fields and records and give examples of the appropriate use of each type. Design files and records appropriate for a particular application. ▪ Distinguish between master and transaction files. ▪ Describe sequential, indexed sequential and direct (random) file access. 	Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions. Homework

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			<ul style="list-style-type: none"> ▪ Distinguish between the use of serial and sequential file access methods in computer applications. ▪ Describe and design algorithms and programs for sequential file access and update. ▪ Explain the need for file security, including file backup, generations of files and transaction logs. Describe the need for archiving files ▪ Explain and apply appropriate techniques for data validation and verification. Design algorithms and programming routines that validate and verify data. • Describe the principal stages involved in the compilation process: lexical analysis, symbol table construction, syntax analysis, semantic analysis, code generation and optimisation. • Describe the distinguishing features of different types of programming paradigms, including procedural, event-driven, visual and mark-up languages. <ul style="list-style-type: none"> ▪ Describe the differences between high-level and low-level languages. ▪ Describe the role of an object-oriented approach to programming and the relationship between object, class and method. ▪ Identify and describe situations that require the use of a high-level or a low-level language. ▪ Identify and justify which type of language would be best suited to develop a solution to a given problem ▪ Describe and discuss the benefits and drawbacks of relational database systems and other contemporary database systems. <ul style="list-style-type: none"> ▪ Describe the use of primary and foreign keys, indexes and links. ▪ Explain and apply entity relationship modelling and use it to analyse simple problems. Describe the advantages of different users having different views of the data in a database. 	<p>Homework will be set each week based on current topic being learnt in class.</p>
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3&4	The operating system	This topic covers the role of the operating system kernel in managing resources, including peripherals, processes, memory protection and backing store.	By completing this topic, students should understand Utility software and how they assist in the management and monitoring computer systems. They will also know the modes of operation of the operating system being batch processing, real time control and real time transaction systems. They will know how to identify applications that would be suitable to these modes of operation. Finally, they will be able to consider a wide range of the human-computer interaction techniques when developing a computer system.	Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions. Homework Homework will be set each week based on current topic being learnt in class.
3&4	Algorithms and programming using python programing language.	This topic covers variables and constants, identifiers, scope of variables, parameters, mathematical operations, sorting, searching, problem analysis and programming constructs.	By completing this topic, students should be able to develop software to solve real life problems, implement computational concepts in python like scope of constants and variables in algorithms and programs, use of self-documenting identifiers, procedure, parameter passing and return. They will be able to use bubble and insertion sort and apply a linear search algorithm in their programs. They will be able analyse a problem using appropriate design approaches and use concepts like sequence, selection and repetition in algorithms and programs.	Students will complete walk through mocks during the lessons to understand how topic will be assessed using past papers. Homework Homework will be set and students will complete specific programming challenges at home to ensure they continue to practise programing.
3&4	Software engineering	This topic covers software packages and CASE tools, Types of software, computer systems for industrial, technical and scientific applications and expert systems and how they are used.	By completing this topic, students will understand range of types of software, including open source software, bespoke and off-the-shelf. They will also understand the role of the computer in weather forecasting, computer aided design, robotics and the use of computer generated graphics and animation. They will be able to use Integrated Development Environment (IDE) tools in developing and debugging software programs.	Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions. Homework Homework will be set each week based on current topic being learnt in class.
3&4	Python programming	This topic covers Tkinter and SQLite	By completing this topic, students should be able to develop software to solve real life problems, implement computational concepts in python like scope of constants and variables in algorithms and programs, use of self-	Students will complete walk through mocks during the lessons to understand how topic will be assessed using past papers.

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			documenting identifiers, procedure, parameter passing and return. They will be able to create windows in python, create relational databases, using SQLite and manipulate and store data in a created application of their choice.	<p>Homework Homework will be set and students will complete specific programming challenges at home to ensure they continue to practise programing.</p>
3&4	Data security and integrity processes	This topic covers privacy and security, Disaster planning, malicious and accidental damage	<p>By completing this topic, students will understand the dangers that can arise from the use of computers to manage files and personal data.</p> <p>They will know of contemporary processes that protect the security and integrity of data including standard clerical procedures like levels of permitted access, passwords for access and write-protect mechanisms.</p> <p>They will know the various potential threats to computer systems and contingency plan to recover from disasters.</p> <p>They will know what malicious and accidental damage to data are and identify situations where either could occur.</p>	<p>Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions.</p> <p>Homework Homework will be set each week based on current topic being learnt in class.</p>
5&6	<p>Database systems (A2) OOP and SQL programming</p> <p>Start component 3 – programming project</p>	Cover the A2 concepts of databases such as normalisation and SQL. These topics will help prepare for the coursework.	<ul style="list-style-type: none"> ▪ Explain what is meant by data consistency, data redundancy and data independence. ▪ Describe and discuss the benefits and drawbacks of relational database systems and other contemporary database systems. ▪ Explain what is meant by relational database organisation and data normalisation (first, second and third normal forms). ▪ Restructure data into third normal form. ▪ Explain and apply entity relationship modelling and use it to analyse simple problems. ▪ Describe the use of primary keys, foreign keys, and indexes. ▪ Describe the advantages of different users having different views of the data in a database. ▪ Explain how the data can be manipulated to provide the user with useful information ▪ Explain and apply appropriate techniques for data validation and verification of data in databases ▪ Explain the purpose of query languages. 	<p>Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions.</p> <p>Homework Homework will be set each week based on current topic being learnt in class.</p>

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			<p>Construct and run queries using Structured Query Language (SQL).</p> <ul style="list-style-type: none"> • Explain the purpose of a database management system (DBMS) and data dictionaries • Explain what is meant by Big Data, predictive analytics, data warehousing and data mining ▪ Explain that distribution can apply to both data and processing. <p>Describe distributed databases and the advantages of such distribution</p>	
5&6	Economic, moral, legal, ethical and cultural issues relating to computer science	<p>This topic covers social and economic changes occurring as a result of developments in computing and computer use, their moral, ethical, legal, cultural and other consequences.</p> <p>The use of computer systems and impact on employment. Current Legislation that impacts the use of computer systems.</p>	<p>By completing this topic, students will understand the possible effects of computers on the nature of employment in the computing industry and wider society. How relevant legislation impacts on security, privacy, data protection and freedom of</p> <ul style="list-style-type: none"> ▪ information. 	<p>Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions.</p> <p>Homework Homework will be set each week based on current topic being learnt in class.</p>
5&6	Python programming	<p>This topic covers Tkinter and SQLite</p>	<p>By completing this topic, students should be able to develop software to solve real life problems, implement computational concepts in python like scope of constants and variables in algorithms and programs, use of self-documenting identifiers, procedure, parameter passing and return. They will be able to create windows in python, create relational databases, using SQLite and manipulate and store data in a created application of their choice.</p>	<p>Students will complete walk through mocks during the lessons to understand how topic will be assessed using past papers.</p> <p>Homework Homework will be set and students will complete specific programming challenges at home to ensure they continue to practise programming.</p>

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5&6	System analysis using the system life cycle(SLC)	This topic covers the different approaches to the analysis and design of programs that Waterfall and Agile methodologies bring.	<p>By completing this topic, students can use the SLC to develop a real life project. With that project they will learn how to construct a feasibility study report, carry out analyses and investigations of a systems using range of methods to include, observations, interviews and questionnaire. Use appropriate diagrammatic form showing the flow of data and the information processing, select suitable hardware and software, use changeover techniques like direct, pilot, phased and parallel, identify the most suitable in a given situation.</p> <p>They will be able to carry out thorough testing of a new systems using beta and acceptance testing techniques. Implement and use perfective, adaptive and corrective maintenance for newly developed system</p> <p>They will know the contents and produce user documentation and maintenance documentation which will include annotated listings, variable lists, algorithms and data dictionaries.</p>	<p>Students will complete walk through mocks to understand how the topic will be assessed using past papers. Targeted questions will be used during teaching and learning sessions. End of unit assessment will be used to judge how well students have learnt and will help identify areas for extra revisions sessions.</p> <p>Homework Homework will be set each week based on current topic being learnt in class.</p>
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