

Year 13

Subject: Computer Science

Half term	Objectives/ enquiry questions	Content	Skills	Assessment
1&2	Data structures	This topic covers how data is stored in computers. Students will discover new concepts such as stacks and queues that haven't yet been covered. 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.	<ul style="list-style-type: none"> ▪ Describe, interpret and manipulate data structures including arrays (up to three dimensions), records, stacks, queues, trees, linked lists and hash tables. ▪ Describe the manipulation of records and arrays. ▪ Represent the operation of stacks and queues using pointers and arrays. ▪ Represent the operation of linked lists and trees using pointers and arrays. ▪ Select, identify and justify appropriate data structures for given situations. 	<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	<p>Hardware and communication</p> <ul style="list-style-type: none"> • Architecture • Fetch-execute cycle • Assembly language • Input/output • Secondary storage • Data disc storage • Networking 	This topic covers, hardware and communication elements of contemporary computer systems and how they are connected.	<ul style="list-style-type: none"> • Identify and describe the hardware and communication elements of contemporary computer systems and how they are connected. • Identify and describe the main components of computer architecture, including Von Neumann and contemporary architectures. • Describe different types of memory and caching. • Describe and explain parallel processing and the limiting factors to parallelisation. • Calculate the runtime of given tasks as a result of parallelisation and evaluate the effect of parallelisation. • Describe the fetch-execute cycle, including how data can be read from RAM into registers • Write simple programs in assembly language and demonstrate how these programs could be executed. • Describe the use of contemporary methods and their associated devices for input and output. 	<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"> • Explain the use of these methods and devices in contemporary computer systems and their suitability in different situations. • Describe and differentiate between voice input for command and control systems to operate a computer system, vocabulary dictation systems for general input and voice print recognition for security. Discuss the suitability of each system in different situations. • Compare the functional characteristics of contemporary secondary storage devices • Explain fragmentation and its consequences and describe the need for defragmentation • Describe networks and how they communicate. • Explain the importance of networking standards. • Describe the importance and the use of a range of contemporary protocols including HTTP, FTP, SMTP, TCP/IP, IMAP, DHCP, UDP and wireless communication protocols. • Explain the role of handshaking. • Identify and describe applications where connecting a portable device to a network is required. • Describe the hardware required to make a wireless connection and explain how this might be achieved using contemporary wireless technologies. 	
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.	<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>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.</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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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.	<ul style="list-style-type: none"> • Describe serial and parallel transmission, their advantages and disadvantages. • Describe simplex, half duplex and full duplex transmission methods. • Explain the need for multiplexing and switching. • Describe, using appropriate network protocols, such as TCP/IP the typical contents of a packet. • Explain network collision, network collision detection and how these collisions are dealt with. • Describe methods of routing traffic on a network. • Calculate data transfer rates on a network. • Calculate lowest cost routes on a network. • Describe the internet in terms of a world-wide communications infrastructure. 	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	Organisation and structure of data	Understanding how data is organised and accessed is covered. This will include different access, validation and verification techniques.	<ul style="list-style-type: none"> • Explain the purpose of files in data processing <ul style="list-style-type: none"> ▪ 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. <ul style="list-style-type: none"> ▪ Distinguish between master and transaction files. ▪ Describe sequential, indexed sequential and direct (random) file access. ▪ Distinguish between the use of serial and sequential file access methods in computer applications. 	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.

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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.	<ul style="list-style-type: none"> • Describe the need for and the role of the operating system kernel in managing resources, including peripherals, processes, memory protection and backing store • Describe the need for and the role of the operating system in providing an interface between the user and the hardware • Explain the hierarchical structure of a directory and describe file attributes • Explain the need for and use of a range of utility software • Describe the main features of batch processing, real time control and real time transaction systems. • Identify and describe applications that would be suitable to these modes of operation • Explain the following types of system: batch, single-user (standalone), multi-user (multi-access), multi-tasking and multi-programming • Explain the need to design systems that are appropriate to the variety of different users at all levels and in different environments • Describe a range of conditions or events which could generate interrupts. • Describe interrupt handling and the use of priorities. 	<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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3&4	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.	<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 use bubble and insertion sort and apply a linear search algorithm in their programs.</p> <p>They will be able analyse a problem using appropriate design approaches and use concepts like sequence, selection and repetition in algorithms and 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 programming.</p>
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.	<ul style="list-style-type: none"> • Describe the types of software tool that have been designed to assist the software engineering process. • Explain the role of appropriate software packages in systems analysis, systems specification, systems design and testing. • Explain the role of Integrated Development Environment (IDE) tools in developing and debugging programs. • Explain program version management. 	<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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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-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.	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	Data security and integrity processes	This topic covers privacy and security, Disaster planning, malicious and accidental damage	<ul style="list-style-type: none"> • Explain the special security and integrity problems which can arise during online updating of files • Describe the dangers that can arise from the use of computers to manage files of personal data • Describe contemporary processes that protect the security and integrity of data including standard clerical procedures, levels of permitted access, passwords for access and write-protect mechanisms • Describe the need for and the purpose of cryptography. • Describe techniques of cryptography and their role in protecting data. • Follow algorithms and programs used in cryptography. • Compare cryptographic methods and their relative strength • Describe the purpose and use of contemporary biometric technologies. • Describe the benefits and drawbacks of biometric technologies. • Describe the complexities of capturing, storing and processing biometric Describe the various potential threats to computer systems. • Describe contingency planning to recover from disasters • Describe malicious and accidental damage to data and identify situations where either could occur • Describe types and mechanisms of malicious software and their vectors. 	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.

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			<ul style="list-style-type: none"> • Describe black hat hacking, white hat hacking and penetration testing 	
5&6	<p>Database systems (A2) OOP and SQL programming</p> <p>Start component 3 – programming project</p>	<p>Cover the A2 concepts of databases such as normalisation and SQL. These topics will help prepare for the coursework.</p>	<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. Construct and run queries using Structured Query Language (SQL). • 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. Describe distributed databases and the advantages of such distribution 	<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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5&6	Economic, moral, legal, ethical and cultural issues relating to computer science	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. The use of computer systems and impact on employment. Current Legislation that impacts the use of computer systems.	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 <ul style="list-style-type: none"> ▪ information. 	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>Homework Homework will be set each week based on current topic being learnt in class.</p>
5&6	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-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.	Students will complete walk through mocks during the lessons to understand how topic will be assessed using past papers. <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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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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