



YEAR 10

YEAR 11

<div><div>Term 1</div><div>Intro to Computer Science</div><div>J277/02: Computational thinking, algorithms and programming</div><div>Algorithms Programming fundamentals</div><div>Term 2</div><div>J277/02: Computational thinking, algorithms and programming</div><div>Programming Fundamentals</div><div>Producing robust programs</div><div>Programming languages and integrated development environments</div><div>Term 3</div><div>J277/02: Computational thinking, algorithms and programming</div><div>Boolean logic</div><div>J277/01: Computer System</div><div>Systems architecture Memory and storage</div><div>Term 4</div><div>J277/01: Computer System</div><div>Computer networks, connections and protocols Network security</div><div>Term 5</div><div>J277/01: Computer System</div><div>Systems software</div><div>Term 6</div></div>	<div><div>Term 1</div><div>J277/02: Computational thinking, algorithms and programming</div><div>Algorithms Programming fundamentals</div><div>Term 2</div><div>J277/02: Computational thinking, algorithms and programming</div><div>Programming Fundamentals</div><div>Producing robust programs</div><div>Programming languages and integrated development environments</div><div>Term 3</div><div>J277/02: Computational thinking, algorithms and programming</div><div>Boolean logic</div><div>J277/01: Computer System</div><div>Systems architecture Memory and storage</div><div>Term 4</div><div>J277/01: Computer System</div><div>Computer networks, connections and protocols Network security</div><div>Term 5</div><div>J277/01: Computer System</div><div>Systems software</div><div>Term 6</div></div>
<div><div>Term 1</div><div><ul style="list-style-type: none">Understand the significance of Computer Science within the modern worldLearn about the expectations of Computer Science studentsUnderstand Computational Thinking Principles:<ul style="list-style-type: none">AbstractionDecompositionAlgorithmic thinkingUnderstand Designing, creating and refining algorithms:<ul style="list-style-type: none">Identify the inputs, processes, and outputs for a problemStructure diagramsCreate, interpret, correct, complete, and refine algorithms using:<ul style="list-style-type: none">PseudocodeFlowchartsReference language/high-level programming languageIdentify common errorsTrace tablesUnderstand Searching and Sorting Algorithms:<ul style="list-style-type: none">Binary SearchLinear SearchBubble sortMerge sortInsertion sortUnderstand Programming fundamentals:<ul style="list-style-type: none">The use of variables, constants, operators, inputs, outputs and assignmentsThe use of the three basic programming constructs used to control the flow of a program:<ul style="list-style-type: none">SequenceSelectionIteration (count- and condition-controlled loops)The common arithmetic operatorsThe common Boolean operators AND, OR and NOTUnderstand Data Types<ul style="list-style-type: none">IntegerRealBooleanCharacter and stringCasting</div></div> <div><div>Term 2</div><div><ul style="list-style-type: none">Understand Additional Programming techniques:<ul style="list-style-type: none">The use of basic string manipulationThe use of basic file handling operations:<ul style="list-style-type: none">OpenReadWriteCloseThe use of records to store dataThe use of SQL to search for dataThe use of arrays (or equivalent) when solving problems, including both one-dimensional (1D) and two-dimensional arrays (2D)How to use sub programs (functions and procedures) to produce structured codeRandom number generationUnderstand Defensive design considerations:<ul style="list-style-type: none">Anticipating misuseAuthenticationInput validationMaintainability:<ul style="list-style-type: none">Use of sub programsNaming conventionsIndentationCommentingUnderstand Testing<ul style="list-style-type: none">The purpose of testingTypes of testing:<ul style="list-style-type: none">IterativeFinal/terminalIdentify syntax and logic errorsSelecting and using suitable test data:<ul style="list-style-type: none">NormalBoundaryInvalid/ErroneousRefining algorithms</div><div><div>Term 3-4</div><div><ul style="list-style-type: none">Understand Boolean Logic:<ul style="list-style-type: none">Simple logic diagrams using the operators AND, OR and NOTTruth tablesCombining Boolean operators using AND, OR and NOTApplying logical operators in truth tables to solve problemsUnderstanding Programming languages and integrated development environments:<ul style="list-style-type: none">Characteristics and purpose of different levels of programming language:<ul style="list-style-type: none">High-level languagesLow-level languagesThe purpose of translatorsThe characteristics of a compiler and an interpreterCommon tools and facilities available in an Integrated Development Environment (IDE):<ul style="list-style-type: none">EditorsError diagnosticsRun-time environmentTranslatorsUnderstanding Systems Architecture<ul style="list-style-type: none">The purpose of the CPU:<ul style="list-style-type: none">The fetch-execute cycleCommon CPU components and their function:<ul style="list-style-type: none">ALU (Arithmetic Logic Unit)CU (Control Unit)CacheRegistersVon Neumann architecture:<ul style="list-style-type: none">MAR (Memory Address Register)MDR (Memory Data Register)Program CounterAccumulatorUnderstanding CPU performance:<ul style="list-style-type: none">How common characteristics of CPUs affect their performance:<ul style="list-style-type: none">Clock speedCache sizeNumber of coresUnderstanding Embedded Systems<ul style="list-style-type: none">The purpose and characteristics of embedded systemsExamples of embedded systemsUnderstand Primary Storage:<ul style="list-style-type: none">The need for primary storageThe difference between RAM and ROMThe purpose of ROM in a computer system o The purpose of RAM in a computer systemVirtual memoryUnderstand Secondary Storage:<ul style="list-style-type: none">The need for secondary storageCommon types of storage:<ul style="list-style-type: none">OpticalMagneticSolid state SuitableStorage devices and storage media for a given applicationThe advantages and disadvantages of different storage devices and storage media relating to these characteristics:<ul style="list-style-type: none">CapacitySpeedPortabilityDurabilityReliabilityCostUnderstand Units:<ul style="list-style-type: none">The units of data storage:<ul style="list-style-type: none">BitNibble (4 bits)Byte (8 bits)Kilobyte (1,000 bytes or 1 KB) Megabyte (1,000 KB)Gigabyte (1,000 MB)Terabyte (1,000 GB)Petabyte (1,000 TB)How data needs to be converted into a binary format to be processed by a computerData capacity and calculation of data capacity requirementsUnderstand Data Storage:<ul style="list-style-type: none">Numbers:<ul style="list-style-type: none">How to convert positive denary whole numbers to binary numbers (up to and including 8 bits) and vice versaHow to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occurHow to convert positive denary whole numbers into 2- digit hexadecimal numbers and vice versaHow to convert binary integers to their hexadecimal equivalents and vice versaBinary shiftsCharacters:<ul style="list-style-type: none">The use of binary codes to represent charactersThe term ‘character set’The relationship between the number of bits per characterin a character set, and the number of characters which can be represented, e.g.:<ul style="list-style-type: none">ASCIIUnicodeImages:<ul style="list-style-type: none">How an image is represented as a series of pixels, represented in binaryMetadataThe effect of colour depth and resolution on:The quality of the imageThe size of an image fileSound:<ul style="list-style-type: none">How sound can be sampled and stored in digital formThe effect of sample rate, duration and bit depth on:The playback qualityThe size of a sound fileUnderstand Compression:<ul style="list-style-type: none">The need for compressionTypes of compression:<ul style="list-style-type: none">LossyLosslessUnderstand Network Topologies:<ul style="list-style-type: none">Types of network:<ul style="list-style-type: none">LAN (Local Area Network)WAN (Wide Area Network)Factors that affect the performance of networksThe different roles of computers in a client-server and a peer-to peer network The hardware needed to connect stand-alone computers into a Local Area Network:<ul style="list-style-type: none">Wireless access pointsRoutersSwitchesNIC (Network Interface Controller/Card)Transmission mediaThe Internet as a worldwide collection of computer networks:<ul style="list-style-type: none">DNS (Domain Name Server)HostingThe CloudWeb servers and clientsStar and Mesh network topologiesUnderstanding wire and wireless networks, protocols and layers<ul style="list-style-type: none">Modes of connection:<ul style="list-style-type: none">WiredEthernetWirelessWi-FiBluetoothEncryptionIP addressing and MAC addressingStandardsCommon protocols including:<ul style="list-style-type: none">TCP/IP (Transmission Control Protocol/Internet Protocol)HTTP (Hyper Text Transfer Protocol)HTTPS (Hyper Text Transfer Protocol Secure)FTP (File Transfer Protocol)POP (Post Office Protocol)IMAP (Internet Message Access Protocol)SMTP (Simple Mail Transfer Protocol)The concept of layersUnderstanding network security:<ul style="list-style-type: none">Threats to computer systems and networks:<ul style="list-style-type: none">Forms of attack:<ul style="list-style-type: none">MalwareSocial engineering, e.g. phishing, people as the ‘weak point’Brute-force attacksDenial of service attacksData interception and theftThe concept of SQL injectionIdentifying and preventing vulnerabilities:<ul style="list-style-type: none">Common prevention methods:<ul style="list-style-type: none">Penetration testingAnti-malware softwareFirewallsUser access levelsPasswordsEncryptionPhysical security</div><div><div>Term 5-6</div><div><ul style="list-style-type: none">Understanding System Software:<ul style="list-style-type: none">Operating Systems:<ul style="list-style-type: none">The purpose and functionality of operating systems:User interfaceMemory management and multitaskingPeripheral management and driversUser managementFile managementUtility Software<ul style="list-style-type: none">The purpose and functionality of utility softwareUtility system software:<ul style="list-style-type: none">Encryption softwareDefragmentationData compressionUnderstanding Ethical, legal, cultural, environmental impacts of digital technology:<ul style="list-style-type: none">Impacts of digital technology on wider society including:<ul style="list-style-type: none">Ethical issuesLegal issuesCultural issuesEnvironmental issuesPrivacy issuesLegislation relevant to Computer Science:<ul style="list-style-type: none">The Data Protection Act 2018Computer Misuse Act 1990Copyright Designs and Patents Act 1988Software licences (i.e. open source and proprietary)</div></div></div></div>	<div><div>Term 1</div><div>Understand the significance of Computer Science within the modern world</div><div>Learn about the expectations of Computer Science students</div><div>Understand Computational Thinking Principles:<ul style="list-style-type: none">AbstractionDecompositionAlgorithmic thinking</div><div>Understand Designing, creating and refining algorithms:<ul style="list-style-type: none">Identify the inputs, processes, and outputs for a problemStructure diagramsCreate, interpret, correct, complete, and refine algorithms using:<ul style="list-style-type: none">PseudocodeFlowchartsReference language/high-level programming languageIdentify common errorsTrace tables</div><div>Understand Searching and Sorting Algorithms:<ul style="list-style-type: none">Binary SearchLinear SearchBubble sortMerge sortInsertion sort</div><div>Understand Programming fundamentals:<ul style="list-style-type: none">The use of variables, constants, operators, inputs, outputs and assignmentsThe use of the three basic programming constructs used to control the flow of a program:<ul style="list-style-type: none">SequenceSelectionIteration (count- and condition-controlled loops)The common arithmetic operatorsThe common Boolean operators AND, OR and NOT</div><div>Understand Data Types<ul style="list-style-type: none">IntegerRealBooleanCharacter and stringCasting</div><div><div>Term 2</div><div><ul style="list-style-type: none">Understand Additional Programming techniques:<ul style="list-style-type: none">The use of basic string manipulationThe use of basic file handling operations:<ul style="list-style-type: none">OpenReadWriteCloseThe use of records to store dataThe use of SQL to search for dataThe use of arrays (or equivalent) when solving problems, including both one-dimensional (1D) and two-dimensional arrays (2D)How to use sub programs (functions and procedures) to produce structured codeRandom number generationUnderstand Defensive design considerations:<ul style="list-style-type: none">Anticipating misuseAuthenticationInput validationMaintainability:<ul style="list-style-type: none">Use of sub programsNaming conventionsIndentationCommentingUnderstand Testing<ul style="list-style-type: none">The purpose of testingTypes of testing:<ul style="list-style-type: none">IterativeFinal/terminalIdentify syntax and logic errorsSelecting and using suitable test data:<ul style="list-style-type: none">NormalBoundaryInvalid/ErroneousRefining algorithms</div><div><div>Term 3-4</div><div><ul style="list-style-type: none">Understand Boolean Logic:<ul style="list-style-type: none">Simple logic diagrams using the operators AND, OR and NOT o Truth tablesCombining Boolean operators using AND, OR and NOTApplying logical operators in truth tables to solve problemsUnderstanding Programming languages and integrated development environments:<ul style="list-style-type: none">Characteristics and purpose of different levels of programming language:<ul style="list-style-type: none">High-level languagesLow-level languagesThe purpose of translatorsThe characteristics of a compiler and an interpreterCommon tools and facilities available in an Integrated Development Environment (IDE):<ul style="list-style-type: none">EditorsError diagnosticsRun-time environmentTranslatorsUnderstanding Systems Architecture<ul style="list-style-type: none">The purpose of the CPU:<ul style="list-style-type: none">The fetch-execute cycleCommon CPU components and their function:<ul style="list-style-type: none">ALU (Arithmetic Logic Unit)CU (Control Unit)CacheRegistersVon Neumann architecture:<ul style="list-style-type: none">MAR (Memory Address Register)MDR (Memory Data Register)Program CounterAccumulatorUnderstanding CPU performance:<ul style="list-style-type: none">How common characteristics of CPUs affect their performance:<ul style="list-style-type: none">Clock speedCache sizeNumber of coresUnderstanding Embedded Systems<ul style="list-style-type: none">The purpose and characteristics of embedded systemsExamples of embedded systemsUnderstand Primary Storage:<ul style="list-style-type: none">The need for primary storageThe difference between RAM and ROMThe purpose of ROM in a computer systemThe purpose of RAM in a computer systemVirtual memoryUnderstand Secondary Storage:<ul style="list-style-type: none">The need for secondary storageCommon types of storage:<ul style="list-style-type: none">OpticalMagneticSolid state SuitableStorage devices and storage media for a given applicationThe advantages and disadvantages of different storage devices and storage media relating to these characteristics:<ul style="list-style-type: none">CapacitySpeedPortabilityDurabilityReliabilityCostUnderstand Units:<ul style="list-style-type: none">The units of data storage:<ul style="list-style-type: none">BitNibble (4 bits)Byte (8 bits)Kilobyte (1,000 bytes or 1 KB)Megabyte (1,000 KB)Gigabyte (1,000 MB)Terabyte (1,000 GB)Petabyte (1,000 TB)How data needs to be converted into a binary format to be processed by a computerData capacity and calculation of data capacity requirementsUnderstand Data Storage:<ul style="list-style-type: none">Numbers:<ul style="list-style-type: none">How to convert positive denary whole numbers to binary numbers (up to and including 8 bits) and vice versaHow to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occurHow to convert positive denary whole numbers into 2- digit hexadecimal numbers and vice versaHow to convert binary integers to their hexadecimal equivalents and vice versaBinary shiftsCharacters:<ul style="list-style-type: none">The use of binary codes to represent charactersThe term ‘character set’The relationship between the number of bits per characterin a character set, and the number of characters which can be represented, e.g.:<ul style="list-style-type: none">ASCIIUnicodeImages:<ul style="list-style-type: none">How an image is represented as a series of pixels, represented in binaryMetadataThe effect of colour depth and resolution on:The quality of the imageThe size of an image fileSound:<ul style="list-style-type: none">How sound can be sampled and stored in digital formThe effect of sample rate, duration and bit depth on:The playback qualityThe size of a sound fileUnderstand Compression:<ul style="list-style-type: none">The need for compressionTypes of compression:<ul style="list-style-type: none">LossyLosslessUnderstand Network Topologies:<ul style="list-style-type: none">Types of network:<ul style="list-style-type: none">LAN (Local Area Network)WAN (Wide Area Network)Factors that affect the performance of networksThe different roles of computers in a client-server and a peer-to peer networkThe hardware needed to connect stand-alone computers into a Local Area Network:<ul style="list-style-type: none">Wireless access pointsRoutersSwitchesNIC (Network Interface Controller/Card)Transmission mediaThe Internet as a worldwide collection of computer networks:<ul style="list-style-type: none">DNS (Domain Name Server)HostingThe CloudWeb servers and clientsStar and Mesh network topologiesUnderstanding wire and wireless networks, protocols and layers<ul style="list-style-type: none">Modes of connection:<ul style="list-style-type: none">WiredEthernetWirelessWi-FiBluetoothEncryptionIP addressing and MAC addressingStandardsCommon protocols including:<ul style="list-style-type: none">TCP/IP (Transmission Control Protocol/Internet Protocol)HTTP (Hyper Text Transfer Protocol)HTTPS (Hyper Text Transfer Protocol Secure)FTP (File Transfer Protocol)POP (Post Office Protocol)IMAP (Internet Message Access Protocol)SMTP (Simple Mail Transfer Protocol)The concept of layersUnderstanding network security:<ul style="list-style-type: none">Threats to computer systems and networks:<ul style="list-style-type: none">Forms of attack:<ul style="list-style-type: none">MalwareSocial engineering, e.g. phishing, people as the ‘weak point’Brute-force attacksDenial of service attacksData interception and theftThe concept of SQL injectionIdentifying and preventing vulnerabilities:<ul style="list-style-type: none">Common prevention methods:<ul style="list-style-type: none">Penetration testingAnti-malware softwareFirewallsUser access levelsPasswordsEncryptionPhysical security</div><div><div>Term 5-6</div><div><ul style="list-style-type: none">Understanding System Software:<ul style="list-style-type: none">Operating Systems:<ul style="list-style-type: none">The purpose and functionality of operating systems:User interfaceMemory management and multitaskingPeripheral management and driversUser managementFile managementUtility Software<ul style="list-style-type: none">The purpose and functionality of utility softwareUtility system software:<ul style="list-style-type: none">Encryption softwareDefragmentationData compressionUnderstanding Ethical, legal, cultural, environmental impacts of digital technology:<ul style="list-style-type: none">Impacts of digital technology on wider society including:<ul style="list-style-type: none">Ethical issuesLegal issuesCultural issuesEnvironmental issuesPrivacy issuesLegislation relevant to Computer Science:<ul style="list-style-type: none">The Data Protection Act 2018Computer Misuse Act 1990Copyright Designs and Patents Act 1988Software licences (i.e. open source and proprietary)</div></div></div></div></div>