NKS Computing Curriculum Map 2022/2023

The purpose of studying Computing at NKS:

From KS1-3, students are required to study Computing as a foundation N/C subject and is comprised of three parts : Computer Science, Information Technology and Digital Literacy. The aim of our KS3 course in Years 7 and 8 is to consolidate the increasingly sophisticated basic programming and IT skills developed at Primary phase and then bridge towards either the specialist choice of Computer Science GCSE, or the appreciation and use of Computing in their ongoing work across other subjects. At KS4, students continue their study of computing with an extra-curricular development of further IT skills, functional training in collaborative use of cloud applications and programming using the IDEA Bronze Award which is offered to students in Year 10.

Between 40 and 60% of students choose to study GCSE Computer Science. During Year 7 and 8, some GCSE topics are featured at basic level. Year 9 provides the opportunity to develop the programming techniques studied in Y7-8 to a deeper level, with particular attention to rigor and terminology, as preparation for studying the higher level theory topics. The Year 9 course provides a bridge between the generalised KS3 course and the examination-focused Y10-11 courses. The focus of Year 10-11 is on completion of GCSE Practical skill project, the learning of high level topics and preparation for the terminal examinations.

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Year 7

Prior to joining NKS students will have studied basic programming techniques using on-screen web-based (usually block based) programming tools. Some students will have experienced practical applications of these such as robotic tools and have learned basic uses of modelling packages such as Excel, and the ability to create screen/paper-based documents using software such as Word/Powerpoint, as well as the use of the internet to find information. Degree of extent to technical knowledge and terminology-use varies considerably, depending on the specialist knowledge of teachers in Year 5 and Year 6 in particular.

Our curriculum builds on and extends this by allowing students to show their existing skills, both through formal baseline testing and practical work with Scratch initially and MakeCode later in the year. Students are introduced to cloud-documentation and work-collation using OneNote in particular, and the skills of generating evidence & explanations to show their understanding. Early taster lessons of GCSE-style content (with Visual Basic and Hardware theory) give students a transition towards the Year 8 course.

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Content – Knowledge and Understanding **Skills and concepts**	Baseline Testing IT: Presentation DL : E-Safety - - - - - - - - - **Programming :** Sequencing, Selection, Iteration **Online safety :** Digital footprint, physical and emotional risk	IT : Audience/Purpose Co: Block based coding (Scratch review – KS2 transition unit) - - - - - - - - - **Research and presentation skills :** difference between paper-based and screen-based presentation **Understanding of programming structures :** Sequence, Selection and Iteration in written statements and evidence	IT : Numerical modelling (Spreadsheet) - - - - - - - - - **IT :** numerical modelling concepts; formulas; relative/absolute references, cell-dependency.	CS : MakeCode – Embedded devices programming IT : Advanced modelling, Data Types - - - - - - - - - **Programming Structures:** planning and developing algorithmic solutions, graphics, block programming, functions of embedded devices, **IT:** conditional formatting, formulas, **Prog :** selection	CS : Hardware GCSE-lite Theory unit - - - - - - - - - **Comp:** development of knowledge-based learning, familiarisation with CS theory learning and assessment. Input/Output and storage.	CS : Visual Basic introduction IT/CS : Robotics and programming - RoboMind - - - - - - - - **Programming:** sequence, written command programming languages, use of Visual Studio IDE **IT:** Robotics and control, programming, C-based language structure,
Assessment	**ALL YEAR 7 UNITS ASSESSED VIA PRACTICAL ASSIGNMENTS WITH FOCUS ON WRITTEN EVIDENCIAL REPORTS**	**Grading Scheme targeted at Grades 2-4 in CAS GCSE Pathway, and reported as W M E grades**				
Enrichment and extension	Extra-curric. * Cyber-club – focuses on entry to cyber challenge competitions ME					

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Year 8

Our Y8 curriculum builds on and extends the work done in Y7 by focusing on deeper programming concepts (selection and iteration) and developing students' knowledge of data storage. Familiarisation with GCSE-style concepts and assessment. New exploration of work methods and presentation/quality of evidence to support knowledge-learning, and green-pen review of written assessments.

It prepares students for the GCSE programme by using GCSE topics to develop clear understanding of GCSE style, content and assessment.

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Content – Knowledge and Understanding **Skills and concepts**	CS : Visual Basic – Writing algorithms with selection **Programming:** selection within programming using IF…THEN…ELSE…ENDIF structures. Flowcharting symbols and documentation.	CS : Binary-Decimal conversion and ASCII - GCSE-Lite theory CS : Visual Basic – Select-Case **Number representation:** how denary numbers are represented in base 2 number system	CS : Hex-Decimal conversion - GCSE-Lite theory CS : Visual Basic – Definite loops (count controlled) **Number representation:** different number bases, denary to hexadecimal and lossless compression of number bases **Programming:** purpose and coding of fixed (definite) loops	IT : Collaborative use of cloud applications and storage CS: Visual Basic – Indefinite loops (condition controlled) **IT:** using cloud applications to share the creation of documents collaboratively **Programming:** purpose and coding of condition-controlled (indefinite) loops.	IT/DL : HTML and CSS – programming the web, creating web content **IT:** Understanding how web pages are displayed with scripting and coding **Programming:** basic CSS scripting and javascript (extension)	CS/IT : Ext of web development ; basic Javascript CS : Game programming with Kodu (end of year non-assessed unit) **Programming:** application of seq/sel/iteration within simple object oriented coding environment within Xbox game engine
Assessment	**ALL YEAR 7 UNITS ASSESSED VIA PRACTICAL ASSIGNMENTS WITH FOCUS ON WRITTEN EVIDENCIAL REPORTS**	**Grading Scheme targeted at Grades 3-5 in CAS Computing Progression Pathway**				
Enrichment and extension	Extra-curric. * Cyber-club – focuses on entry to cyber challenge competitions ME					

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Year 9 GCSE Computer Science

Our Y9 curriculum builds on and extends the work done in Y8 by providing students with further programming experience, interleaved with further IT experience during their Computer Science lessons. During KS4, students are extended in their IT skills, Digital literacy and programming through our Duke of York Inspiring Digital Enterprise Award, and students are focused on trying to gain the Bronze award during Year 9 and 10, with encouragement to achieve Silver, as proof they are a "digital native" and have core Computing skills. This also provides a platform (with Mathematics at Grade 7 or higher) for application to the A-Level Computer Science course if students do not study GCSE Computer Science. Those that do choose to study Computer Science consolidate terminology, knowledge and skills from Years 7 and 8, and rapidly move towards GCSE-level content and expectations of quality of their written responses.

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Content – **GCSE CS** Knowledge and Understanding **Skills and concepts**	Unit 1 : Data representation part 1 Unit 2 : VB Review – Storing data, data types and sequencing - **Data Representation :** Binary, Hexadecimal and denary conversion **Programming:** Data types, Sequences and program flow	Unit 1 Data Representation and logic part 2 Unit 2 – OCR Reference languages, variables and constants - **Data Representation :** storage methods for text, images, sound and compression **Programming:** Pseudocode and in-program storage of data	Unit 1 CPU, Primary Storage Unit 2 Pseudocode focus ; Selection and Conditions Boolean logic - **Theory Knowledge:** CPU – Fetch Execute Cycle & RAM Boolean logic AND/OR/NOT **Programming :** selection and conditions	Unit 1 Secondary Storage Unit 2 : Iteration - **Theory knowledge:** secondary storage / non-volatile and virtual storage **Programming:** writing pseudocode with definite and indefinite loops	Unit 1 Networking technologies LAN/WAN Unit 2 : Data structures (Strings) - **Theory knowledge:** local and wide area networks **Programming:** static data structures, strings	Unit 1 Networking technologies-Internet & Topologies Unit 2 : Computational thinking for creating algorithms - - - - - - - - - - - - - - - - - - - **Theory knowledge:** network layouts and the structure and use of the internet **Programming:** Computational thinking and problem solving
Assessment	**THEORY UNITS ASSESSED VIA END-OF-UNIT EXAM QUESTION STYLE TESTS (grades 4-8)**	**SKILL UNITS ASSESSED VIA WRITTEN EVIDENCE REPORTS (grades 4-7)**				
Enrichment and extension	Extra-curric. * G14 – Extra lunchtime study support * M24 – Lunchtime programming support and coaching (with prefects) **EXTENSION BEYOND KS4 CURRICULUM :** Number representation : discussion of other number bases, eg Octal Programming : encouragement to pursue and examination of other programming languages, eg Python, to encourage "bi-lingual" status Processor Architectures : mention of and contrast with Harvard Architecture, taught at A-Level, for example differences in approach of cache, and the approach to virtual memory (paging/segmentation)					

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Year 10 GCSE Computer Science

Our Y10 curriculum builds on and extends the work done in Y9 by completing the data structures and file methods, and then problem solving practise, then the completion of the 20 hour programming project ahead of Year 11. Examination practise questions are provided to review and build on the topics covered in Year 9, as well as completion of Unit 1 theory.

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Content – **GCSE CS** Knowledge and Understanding **Skills and concepts**	Unit 1 : Network Technologies – Wifi, Encryption and Protocols Unit 2 : Arrays - - - - - - - - - - **Programming :** storage of multiple data items of the same type as an array	Unit 1 : Network Security Unit 2 : Record storage, Validation and SQL - - - - - - - - - - **Theory knowledge :** understanding risks to network and ways to mitigate these risks **Programming :** storage of compound data elements, fields and records, and checking user data entry errors	Unit 1 : Software (OS, Utilities and Applications Unit 2 : File I/O, Functions & Procedures - - - - - - - - - - **Theory knowledge:** Purpose and structure of operating systems and relationship to other software types **Programming:** secondary storage of data and modular programming structures	PPE Review Unit 2 Programming Challenges, Problem solving and OCR pseudocode - - - - - - - - - - **Analysis of weakness :** teaching the bringing together of learning evidence (incl Y10 exam) to complete audit of revision priorities. **Programming :** algorithm design strategies – formula for algorithm questions	Unit 1 : Ethical, Economic, Environmental and Social Implications of Computing - - - - - - - - - - **Theory & exam skills** : Written question argument, structuring long answer questions and question-analysis. **Computational thinking:** examination of abstraction and modular programming, and applying this to a variety of problems	Unit 1 – PLC Audit, 1.1-1.3 Exam Review Unit 2 : 2.1 Searching and sorting introduction - - - - - - - - - - **Algorithms :** searching and sorting and the comparison of the efficiency and features of different algorithms.
Assessment	**THEORY UNITS ASSESSED VIA END-OF-UNIT EXAM QUESTION STYLE TESTS (grades 4-8)**	**SKILL UNITS ASSESSED VIA WRITTEN EVIDENCE REPORTS (grades 4-8)**	**YEAR 10 PPE PROVIDES EXAMINATION EXPERIENCE AND FEEDBACK**			
Enrichment and extension	Extra-curric. * G14 – Extra lunchtime study support * M24 – Lunchtime programming support and coaching (with prefects) **EXTENSION BEYOND KS4 CURRICULUM :** Networking : application of network topology to a real life example – the Yacht project: connecting different sections of a ship given restrictions of water-tightness and bulkhead gaps Functions : adding the concept of recursive functions and their application Wider consequences of computing use: exploration of wider consequence beyond limited GCSE-specification, eg more complex legal arguments between users of copyright material and producers.					

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Year 11 GCSE Computer Science

Our Y11 curriculum builds on and extends the work done in Y10 by allowing the students to conduct the review of their algorithmic skill elements alongside the practise of longer written questions, and the audit of their examination skills/weaknesses. Students spend a great deal of time being given the space to develop their confidence in context-based algorithm generation to give them the resilience/confidence to face any exam question, but also to refine their wider problem solving skills.

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Content – Knowledge and Understanding **Skills and concepts**	Unit 1.4-1.6 Exam review Unit 2.2 Exam Review Unit 2 : 2.1 Computational Thinking, Sorting and Searching (exam focus) (PPE preparation) - - - - - - - - - **Skills :** how to answer conceptual programming questions and review of algorithm analysis skills – identification of errors, completion of algorithms and tracing algorithms.	PPE Exam period PPE review Unit 2.3 : Defensive design - - - - - - - - - **Knowledge :** Validation, verification, how to make programs easily maintainable, comments, variables, algorithm design review and practise. **Exam analysis :** PPE review and PLC re-generation	Unit 2.5 : IDE features, compilation and interpretation Unit 2 Exam Review Unit 1 PPE and review Unit 2 (NEA) : Review and documentation – check & submit - - - - - - - - - **Knowledge :** features of Integrated development environments and the benefits to programmers. **Exam analysis :** review of PLC and weaknesses	Unit 2 PPE & review Mixed examination practise - - - - - - - - - **Examination skills :** analysis of questions, timing and accuracy, presentation of working-out, SPaG, feelings under pressure of time	Final examination preparation (Exams in wk 4) - - - - - - - - - **Examination experience :** algorithm question experience, review of final remaining weaker areas – directing individual revision programme.	N/A
Assessment	**THEORY UNITS ASSESSED VIA END-OF-UNIT EXAM QUESTION STYLE TESTS (grades 5-9)**	**PPEs MATCHED TO GCSE STANDARD AND MODERATED (grades 5-9)**	EXAM FOCUSED ASSESSMENT CONTINUED UNTIL END OF TERM 5			
Enrichment and extension	Extra-curric. * G14 – Extra lunchtime study support * M24 – Lunchtime programming support and coaching (with prefects) **EXTENSION BEYOND KS4 CURRICULUM :** Problem solving : key development of general problem solving strategies – breaking down of tasks, modularisation, abstraction and the KS5 concepts of concurrency. Taster of A-Level: opportunity to experience and explore A-Level teaching concepts, both theory beyond logic/number representation and language development with c#					

NKS Computing Curriculum Map 2021

Year 12

Prior to commencing A Level students will have studied KS1-KS3 Computing and most students will have studied Mathematics and Computer Science GCSE to a good grade. All students will be familiar with basic computing technology and the way computers work (CPU, memory, storage, networking), OSs and application software and experience of at least one written programming language.

An understanding of students' starting points is achieved by early initial testing and exploration of experience of initial practical tasks. Students with known gaps (eg student that begin from high Maths GCSE entry requirement) are given support materials and individual coaching.

Our Y12 curriculum builds on and extends this by…deepening the students' understanding of the hardware of a computer, and developing bilingual language status by moving all students from the common Python/Visual Basic experience at GCSE to the new language c#. Students quickly develop their ideas and preparation for their Unit 3 project.

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Content – Knowledge and Understanding **Skills and concepts**	Unit 1.1 Harvard Architecture, Structure and function of processor Unit 1.4 Data Representation Unit 2.2 – C# Sequence, Selection, Iteration, - - - - - - - - - - **Knowledge :** Deepening of CPU structure and extended F.E.Cycle **Skills :** Basic programming constructs converted to C# from prior language	Unit 1.1 : Input, Output devices, Storage and Virtual Storage Unit 1.2 – Software Development methodologies Unit 1.4 – Logic and truth tables Unit 2.2 – C# Arrays, procedures, functions - - - - - - - - - **Knowledge :** IO/Storage /Cloud storage, coursework requirements and development methologies, basic logic review from GCSE extended to additional logic gates **Skills :** Static data structures, combined storage using arrays and lists, and modular coding in c#	Unit 1.3 Compression, Encryption and Hashing, Database methods Unit 1.4 Logical Expressions, Programming Paradigms, LMC Assembler Unit 2.2 – Object Oriented code development Project Idea check - - - - - - - - - - **Knowledge :** Additional storage methologies, compressions and hashing storage, simplification of logical expressions, different language methodologies **Skills :** Practical and theoretical OOP concepts (classes, objects, inheritance, polymorphism…)	Unit 1.3 – Web Technologies Unit 1.4 – Class diagrams and definitions Unit 1.2 – System Software - - - - - - - - - **Knowledge :** HTML and CSS methods and application. Understanding class UML diagrams and recall of the definitions for class structures **Skills :** algorithm development and OCR pseudocode writing	Unit 1.3 – Review and testing Unit 1.2 – Code Generation Unit 1.4 – Logical Expressions with Karnaugh Maps Project Analysis Check - - - - - - - - - **Knowledge :** Web technologies and Unit 1 review, Compilation and Interpretation methods and stages **Skills :** simplification of logical expressions using a Karnaugh map.	Unit 1.5 – Computing related Legislation 1.4 – Floating point binary representation and Arithmetic Unit 2.3 – Intro to basic data structures – the Algorithm Guide study resource - - - - - - - - - **Knowledge :** How legal frameworks in the UK fit to computer science. **Skills :** structuring and answering longer answer examination questions. representation of numbers and arithmetic using a mantissa and exponent.
Assessment	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**
Enrichment and extension	**EXTENSION BEYOND KS5 CURRICULUM :** **CPU Architecture:** beyond Harvard ; differences between different types of processor models, concurrency **Language development:** extension beyond VB/Python and C# - examination of higher level languages such as Prolog and Haskell **Project development support:** tutorials to support the use of platforms such as Unity for c#-based app/game development					

NKS Computing Curriculum Map 2021

Year 13

Our Y13 curriculum builds on and extends the work done in Y12 by deepening the topics already met, applying this to examination preparation and practise, and giving view to further study. A majority of Y13 students in recent years have moved on to higher education in Computer Science.

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Content – Knowledge and Understanding **Skills and concepts**	1.5 – Moral and Ethical Issues Unit 1.4 – Data Structures : Lists, Tuples, Trees, Graphs 2.3 – Algorithms for searching and sorting Project Design Check - - - - - - - - - **Knowledge :** the impact of CS in moral and ethical aspects, with further long answer/essay structure training. Further algorithms for sorting and searching, and relative efficiencies using Big O notation. **Skills :** Definitions and diagrams for all static and dynamic data structures. Basic data structure algorithms.	2.3 – Path analysis (Dijkstra and A*), Algorithm Complexity (Big O) Examination preparation and practise, PPE prep Project Development check - - - - - - - - - **Knowledge:** further examination of Big-O notation for time and space complexity, applied to further algorithms such as shortest path methods. **Skills :** finding the shortest path. Review and testing in project assignment.	PPE Examination PPE Review Examination preparation and practise - - - - - - - - - **Knowledge:** Different phrasing of examination questions **Skills:** mark scheme analysis, examination technique. Developmental testing of project assignment.	Examination practise and Spring PPE **<u>Project Deadline</u>** - - - - - - - - - **Knowledge:** Timing for examination questions. How keywords in examination questions change the answer you are expected to provide. **Skills:** Summative testing of application and evaluation applied to project assignment.	Examination questions final practise and technique - - - - - - - - - **Skills:** How to take existing examination questions and create alternative questions to widen experience for examination preparation	N/A - - - - - - -
Assessment	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED UNIT BY UNIT BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED BY EXAM QUESTIONS AND PPEs**	**ASSESSMENT IS COMPLETED BY EXAM QUESTIONS AND PPEs**	
Enrichment and extension	**EXTENSION BEYOND KS5 CURRICULUM :** **Number representation:** application of floating point arithmetic to the process of multiplying numbers (not in GCE). **Searching and sorting:** different sorting algorithm comparisons beyond the four required in specification – eg bit-shifting and masking.					