CURRICULUM – COMPUTER SCIENCE

Intent, Curriculum Map & Age Related Expectations

Abstract

Students are carefully provided with feedback on their learning to enable them to improve.
They gain the knowledge leading onto the skills that are necessary to enable them to become successful lifelong learners.

DBR / ANE

Southchurch High School

Contents

Whole School INTENT

Southchurch students embrace learning opportunities.

INTENT, IMPLEMENTATION & IMPACT

Intent • Southchurch students will draw on real world experiences to provide an engaging viewpoint of computing concepts and solve problems by building their own programmes and applications.
Implementation • Sequencing of the curriculum • Adaptive teaching (to take into account of what the learners know and don't know) • Extending opportunities for extracurricular
Impact • All students will achieve their potential with altered trajectories

KS2 Links

KS 1 & 2 Computing

CURRICULUM MAP

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<tr><td>Yr 8</td><td colspan="7">1.Media – Vector graphics
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t</td><td colspan="6">4.Representations – going audiovisual
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KS5 Links

AS & A-Level Computer Science

Cambridge Technical Level 3

AGE RELATED EXPECTATIONS

YEAR 7

	Topics / Units	**Strand 1: Computational Thinking** Problem Solving & Algorithms	**Strand 2: Programming** Scratch, Python	**Strand 3: Data Representation** Databases, Binary & Boolean Logic	**Strand 4: Computers** Hardware, Software & Operating Systems	**Strand 5: Networking** Internet, Networking & Security	**Strand 6: Information Technology** Digital Literacy, Graphic Design & AI
4	**EXPERT**	• Constructs solutions (algorithms) that use repetition and two-way selection. • Solves problems through decomposition.	• Uses logical reasoning to predict the behaviour of programs. • Builds programs that implement algorithms to achieve given goals.	• Illustrates how digital computers use binary to represent all data. • Summarises the relationship between data representation and data quality.	• Classifies a range of software including operating systems, utility and application software.	• Summarises the difference between the internet and internet service e.g. world wide web. • Shows an awareness of, and can use a range of internet services e.g. VOIP.	• Uses a variety of software to manipulate and present digital content: data and information. • Creates digital content to achieve a given goal through combining software packages and internet services to communicate with a wider audience
3	**ADVANCED**	• Demonstrates simple algorithms using loops, and selection. • Detects and corrects errors i.e. debugging, in algorithms.	• Demonstrates how arithmetic operators, if statements, and loops, are used within programs. • Declares and assigns variables.	• Classifies different types of data (text, number) and understands how these are used in different situations. • Demonstrates how filters or single criteria searches can find information.	• Explains the difference between hardware and software, and their roles within a computer system. • Gives examples of how data is stored on a computer.	• Understands the importance of communicating safely and respectfully online, and the need for keeping personal information private. • Understands how to effectively use search engines. • Understands why computers are connected in a network.	• Shows an awareness for the quality of digital content collected. • Shares their experiences of technology in school and beyond the classroom. • Talks about their work and makes improvements to solutions based on feedback received.
2	**DEVELOPING**	• Understands that computers need precise instructions. • Demonstrates care and precision to avoid errors.	• Knows that users can develop their own programs, and can demonstrate this by creating a simple program in an environment that does not rely on text. • Detects and corrects simple semantic errors i.e. debugging, in programs.	• Understands the difference between data and information. • Knows why sorting data in a flat file can improve searching for information.	• Explains the function of the main internal parts of basic computer architecture. • Outlines the concepts behind the input-process-output cycle.	• Navigates the web and can carry out simple web searches to collect digital content. • Explains the difference between a web browser and a search engine.	• Demonstrates how to store and edit digital content using appropriate file and folder names.
1	**POTENTIAL**	• Defines what an algorithm is. • Reproduces/ Follows algorithms step-by-step.	• Observes that programs execute by following precise instructions. • Executes, checks and changes programs.	• Recognises that digital content can be represented in many forms. • Distinguishes between some of these forms and can explain the different ways that they communicate information. • Recognises that data can be structured in tables to make it useful.	• Recognises that a range of digital devices can be considered a computer. • Recognises and can use a range of input and output devices. • Recognises that all software executed on digital devices is programmed.	• Obtains content from the world wide web using a web browser. • Knows what to do when concerned about content or being contacted.	• Demonstrates use of computers safely and responsibly, knowing a range of ways to report unacceptable content and contact when online. • Understands the legal frameworks governing the use of information.

YEAR 8

	Topics / Units	Strand 1: Computational Thinking Problem Solving & Algorithms	Strand 2: Programming Scratch, Python	Strand 3: Data Representation Databases, Binary & Boolean Logic	Strand 4: Computers Hardware, Software & Operating Systems	Strand 5: Networking Internet, Networking & Security	Strand 6: Information Technology Digital Literacy, Graphic Design & AI
4	**EXPERT**	• Finds where information can be filtered out in generalising problem solutions (abstraction).	• Designs, writes and debugs modular programs using functions. • Selects appropriate variables and relational operators within a loop to govern termination. • Establishes the difference between a while loop and a for loop.	• Examines how processors' instruction sets relate to low-level instructions carried out by a computer.	• Investigates the differences between different Operating Systems, and the advantages and disadvantages of these.	• Examines the importance of network security including simple security techniques such as strong passwords.	• Makes judgements about digital content when evaluating and repurposing it for a given audience. • Recognises the audience when designing and creating digital content.
3	**ADVANCED**	• Uses logical reasoning to predict outputs, showing an awareness of inputs. • Selects similarities and differences in situations and uses these to solve problems (pattern recognition).	• Identifies the differences between, and appropriately uses if and if, then and else statements. • Has practical experience of a high-level textual language.	• Illustrates how bit patterns represent numbers, images and sound.	• Uses a range of application software to carry out designated tasks.	• Demonstrates data transmission between digital computers over networks, including the internet i.e. IP addresses and packet switching. • Constructs static web pages using HTML. • Manipulates simple encryption techniques.	• Undertakes creative projects that collect, analyse, and evaluate data to meet the needs of a known user group. • Effectively designs and creates digital artefacts for a wider or remote audience.
2	**DEVELOPING**	• Constructs solutions (algorithms) that use repetition and two-way selection. • Solves problems through decomposition.	• Uses logical reasoning to predict the behaviour of programs. • Builds programs that implement algorithms to achieve given goals.	• Illustrates how digital computers use binary to represent all data. • Summarises the relationship between data representation and data quality.	• Classifies a range of software including operating systems, utility and application software.	• Summarises the difference between the internet and internet service e.g. world wide web. • Shows an awareness of, and can use a range of internet services e.g. VOIP.	• Uses a variety of software to manipulate and present digital content: data and information. • Creates digital content to achieve a given goal through combining software packages and internet services to communicate with a wider audience
1	**POTENTIAL**	• Demonstrates simple algorithms using loops, and selection. • Detects and corrects errors i.e. debugging, in algorithms.	• Demonstrates how arithmetic operators, if statements, and loops, are used within programs. • Declares and assigns variables.	• Classifies different types of data (text, number) and understands how these are used in different situations. • Demonstrates how filters or single criteria searches can find information.	• Explains the difference between hardware and software, and their roles within a computer system. • Gives examples of how data is stored on a computer.	• Understands the importance of communicating safely and respectfully online, and the need for keeping personal information private. • Understands how to effectively use search engines. • Understands why computers are connected in a network.	• Shows an awareness for the quality of digital content collected. • Shares their experiences of technology in school and beyond the classroom. • Talks about their work and makes improvements to solutions based on feedback received.

YEAR 9

	Topics / Units	**Strand 1: Computational Thinking** Problem Solving & Algorithms	**Strand 2: Programming** Scratch, Python	**Strand 3: Data Representation** Databases, Binary & Boolean Logic	**Strand 4: Computers** Hardware, Software & Operating Systems	**Strand 5: Networking** Internet, Networking & Security	**Strand 6: Information Technology** Digital Literacy, Graphic Design & AI
4	**EXPERT**	• Evaluates the effectiveness of algorithms and models for similar problems.	• Tests solutions thoroughly to determine the effectiveness of the solution. • Appreciates the effect of the scope of a variable.	• Considers the advances in technology and how these have an impact on the power of computers. • Analyses and evaluates data and information, and recognises that poor quality data leads to unreliable results, and inaccurate conclusions.	• Choose an appropriate combination of commands to control a computer system effectively using just a command line.	• Debates the ethical and moral implications on cryptography from a personal, national and world-wide standpoint.	• Debates ethical issues surrounding the application of information technology beyond school. • Evaluates and explains how the use of technology can impact on society.
3	**ADVANCED**	• Develops solutions to complex problems independently.	• Uses a range of operators and expressions e.g. Boolean, and applies them in the context of program control. • Understands and applies parameter passing. • Understands and uses two dimensional data structures.	• Models the relationship between binary and electrical circuits, including Boolean logic through the use of logic tables.	• Uses the command line to model tasks commonly completed with the use of a GUI. • Develop understanding of how Operating Systems manage files.	• Builds models to demonstrate how cryptography is used for encrypting and decrypting data. • Experiments with some common network security methods, including public key encryption.	• Uses criteria to evaluate the quality of solutions, can identify improvements making some refinements to the solution, and future solutions.
2	**DEVELOPING**	• Finds where information can be filtered out in generalising problem solutions (abstraction).	• Designs, writes and debugs modular programs using functions. • Selects appropriate variables and relational operators within a loop to govern termination. • Establishes the difference between a while loop and a for loop.	• Examines how processors' instruction sets relate to low-level instructions carried out by a computer.	• Investigates the differences between different Operating Systems, and the advantages and disadvantages of these.	• Examines the importance of network security including simple security techniques such as strong passwords.	• Makes judgements about digital content when evaluating and repurposing it for a given audience. • Recognises the audience when designing and creating digital content.
1	**POTENTIAL**	• Uses logical reasoning to predict outputs, showing an awareness of inputs. • Selects similarities and differences in situations and uses these to solve problems (pattern recognition).	• Identifies the differences between, and appropriately uses if and if, then and else statements. • Has practical experience of a high-level textual language.	• Illustrates how bit patterns represent numbers, images and sound.	• Uses a range of application software to carry out designated tasks.	• Demonstrates data transmission between digital computers over networks, including the internet i.e. IP addresses and packet switching. • Constructs static web pages using HTML. • Manipulates simple encryption techniques.	• Undertakes creative projects that collect, analyse, and evaluate data to meet the needs of a known user group. • Effectively designs and creates digital artefacts for a wider or remote audience.

KS4 END OF COURSE EXPECTATIONS

OCR's GCSE (9–1) in Computer Science	
Aims and learning outcomes	• Understand and apply the fundamental principles and concepts of Computer Science, including abstraction, decomposition, logic, algorithms, and data representation • Analyse problems in computational terms through practical experience of solving such problems, including designing, writing and debugging programs • Think creatively, innovatively, analytically, logically and critically • Understand the components that make up digital systems, and how they communicate with one another and with other systems • Understand the impacts of digital technology to the individual and to wider society • Apply mathematical skills relevant to Computer Science

Assessment objectives	• AO1: Demonstrate knowledge and understanding of the key concepts and principles of Computer Science.
	• AO2: Apply knowledge and understanding of key concepts and principles of Computer Science.
	• AO3: Analyse problems in computational terms:
	  ○ to make reasoned judgements
	  ○ to design, program, evaluate and refine solutions.

OCR Specification

DEPARTMENT FEEDBACK POLICY

Formative Feedback

The department will provide continuous formative feedback to students every lesson and track progress each lesson using a holistic 1-4 age related expectation grade.
The department will set topic / unit summative assessments at the end of the topic / unit at set points throughout the year. These will be marked in green pen and improvements fed back to students. These marks will go towards the holistic 1-4 age related expectations formative assessment grade.
A formative assessment data drop will be completed once per half term.

Assessment Feedback Frequency

KS3 will sit a Summative end of year assessment where the percentage achieved in the assessment will be reported to parents/carers as well as a holistic 1-4 formative assessment grade.
In KS4 Year 10 will sit two summative assessments during the year and the percentage mark of the first Assessment Point (AP1) will be reported and shared with parents/carers as well as a working at 1-9 grade. The second will be an end of year assessment mock style exam. Predictive 1-9 grades will then be calculated at the end of the year.
Year 11 will sit one examination rehearsal half way through the year in preparation for their actual exams again providing a more accurate working at grade and prediction for end of year results.

Planning for Feedback

- Feedback must be planned for using the **FEEDFORWARD ASSESSMENT** planning sheets
- This needs to be completed on a specific independent learning activity undertaken in the students' books which should happen every 6-10 lessons.
- Books should be checked at the same time for presentation with an acknowledgement to the student that you have seen their work.
- Feedback should be provided in the following lesson using DIRT (Dedicated Improvement and Reflection Time) activities.
- Red pen by the students should be used to highlight any work done during DIRT activities.

Feedback Expectations

- **Verbal feedback** - Either one to one or as a class. Misconceptions can be addressed easily.
- **Live Feedback** - The teacher gives feedback as they circulate the room. This feedback is then acted on immediately.
- **Questioning** - The teacher uses a range of questioning techniques (cold call, no opt out, say it again better etc) or mini whiteboards to check understanding.
- **Modelling** - The teacher demonstrates what success looks like and scaffolds how to get there. This can be done verbally or in a written format.
- **Visualiser** - This can be used to do a "we write" model answer, to showcase good work or to address misconceptions.
- **Whole class feedback** - After reading all the books and making notes, the teacher gives feedback on strengths, areas for improvement and misconceptions. Time is given to act on improvements.
- **Written feedback** - Teachers use individual written feedback on a specific piece of work and give students time to act on it (DIRT). The time cost here should be carefully considered.

Presentation in Books

- Books should be able to be used as **revision aids** by the students.
- Look for **common misconceptions** in all books; assessing the **quality** of the books; ensuring that **high expectations** for **presentation** are upheld and **SPAG** is addressed.
- Selective independent work will be checked using the **FEEDFORWARD ASSESSMENT** Planning sheet

NATIONAL CURRICULUM LINKS

KS3 & KS4 national curriculum

Purpose of study

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Aims

The national curriculum for computing aims to ensure that all pupils:

- Can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation
- Can analyse problems in computational terms and have repeated practical experience of writing computer programs in order to solve such problems
- Can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems Are responsible, competent, confident and creative users of information and communication technology.

Computer Science National Curriculum Links

Computing National Curriculum

All pupils must have the opportunity to study aspects of information technology and computer science at sufficient depth to allow them to progress to higher levels of study or to a professional career.

In Computer Science students are taught to:

- develop their capability, creativity and knowledge using computers, digital media and information technology
- develop and apply their analytic, problem-solving, design, and computational thinking skills
- understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to identify and report a range of concerns.

Religious Education National Curriculum Links

Agreed Syllabus for Religious Education

Religious Education in English Schools: Non-Statutory Guidance

Within the computing curriculum we focus on developing an understanding of 'worldwide' views through discussion around religious, cultural and ethical computing influences, which is also a component of study at KS4

The demographic of our students influences how we develop our students' understanding and develop their own views of worldwide religious views to ensure that students have a balanced interpretation of different religions.

All pupils receive RE as part of a broad and balanced curriculum at school which promotes their spiritual, moral, social and cultural development.

PERSONAL DEVELOPMENT CURRICULUM

Aims

The computing curriculum is designed to support and promote the vision of Southchurch High School, "A community of Opportunity, Learning and Aspiration". The curriculum recognises not only the importance of allowing students to flourish academically but also our wider role in preparing our students for their adult life beyond school. Our Personal Development programme is underpinned by five core pillars;

- **Equality and Diversity**
- **Cultural Capital**
- **Community and Wellbeing**
- **Careers and Employability**
- **Character Development.**

Character Development: All members of the school community (regardless of background or ability) understand, develop and demonstrate the values that underpin our student mission of a Community of Opportunity, Learning and Aspiration.

- **Community of Opportunity** – All students are supported and encouraged to perform Infront of their peers and watched with mutual respect. Students are provided with various, collaborative group tasks each lesson in which all learners are supported to engage equally and freely share their ideas and opinions.
- **Learning** – All students have equal opportunity to access the curriculum. Students are taught and placed into mixed ability classes, ensuring all students are supported with adapted practice, where necessary, to ensure curriculum access. All students are invited to an array of enrichment opportunities including; clubs, trips and visits.
- **Aspiration** – Students are encouraged to develop their love of design through careers talks, trips and external speakers. They take every opportunity within lesson to learn and take control over their own personal development.

Equality & Diversity: The computing curriculum aims to develop an understanding through discussions and research showing how people of different faiths, convictions, ability, gender, heritage and ethnicity can form a successful, cohesive and happy community that draws from the best in each of us.

- Students will explore how the development of computer systems takes into consideration of cultural, ethical, and religious factors within the designing of new system.
- Promotion of Computer Science to female students because it is currently a male dominated subject.

Wellbeing & Community – The computing curriculum recognises the importance of our students knowing how to care for themselves both mentally and physically, whilst they also develop personal traits and virtues that will motivate and guide students with confidence and resilience.

Cultural Capital – The computing curriculum supports the school's vision in ensuring that all students gain the knowledge and cultural capital they need to succeed in life through a wealth of experiences both in and outside the taught curriculum.

- **Extra curricular**
  - **BBC Microbits**
  - **Raspberry Pi**
- **Trips and visits**
  - **Bletchley Park**
- **Events**
  - **BEBRAS challenge for all students - November**
-
- **British Values:**
- **Individual Liberty**: In computing we understand how to use our right to freedom of speech in a respectable and thoughtful way, being considerate of how this speech will affect
- others. We understand the freedom the internet and computers offer us in discovering information and connecting us with the world.
- **Mutual Respect**: Students are respectful when listening to the opinions and views of other students. We understand that as we are connected with the world while accessing
- the internet, we are exposed to the widest range of views, and we are learning to respect them.
- **The Rule of Law:** The classroom rules enable all students to develop their skills in an environment where equipment and each other's feelings are respected.
- The classroom rules ensure students are all responsible for the learning environment.

- **Tolerance:** Students are tolerant of the opinions and creative ideas of each other. Students value the wide variety of cultures that we explore from all over the world and are tolerant of different faiths and beliefs in the styles we study. We use the opportunities offered in computing to question, challenge and understand people with these different characteristics to support and develop our tolerance of them.
- **Democracy:** Students are all part of the learning experience and are listened to. Students assess each other's work and celebrate each other's successes. All students are granted autonomy and have the opportunity to make choices on how to develop their own creativity. In computing we learn to understand and be considerate of the views of other internet users.
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Careers & Employability – The computing curriculum is designed to ensure students have a breadth of opportunities and experiences that our pupils can start to build their own future pathways on. Through the computing curriculum, our students are supported to develop the following skills;

- Communication
- Confidence
- Teamwork and Leadership
- Listening and Responding
- Logical thinking
- Programming to extend critical thinking and problem solving
- Maths skills
- Research

Events

- BEBRAS challenge

SMSC CURRICULUM LINKS

Spiritual development Through the projects we offer and the curriculum we deliver at both key stages, the pupils are taught how to investigate compuitng system. This includes the environmental, cultural and ethical impacts of how products affect the quality of our daily lives. Pupils are encouraged to develop their thinking skills and explore the wider natural world around them. They are taught to reflect upon what they see and develop ideas and solutions to problems which are both workable and innovative.
Moral development Pupils are faced with moral decisions throughout the computing curriculum. This includes looking at the legislations linked to computing with the Computer Misuse Act and the Data Protection Act. Students also look at Creative Commons License, which is transferrable across their entire curriculum. The ethics within computing are discussed across many areas such as; when looking at “hactivists”; the mining and disposal of materials; and the development of computer systems using AI. Within the classroom and the wider community, the pupils are expected to show respect to others and take responsibility for their own actions and of those around them, taking into consideration the consequences.
Social development Pupils are often asked to make decisions and justify their answers with regards to a scenario. Pupils learn to articulate their thoughts and feelings about their own and other's work. To do this they need to take criticism without offence and provide feedback which is carefully considered and constructive.
Cultural development Pupils are taught that all their computing work should be sensitive to needs and beliefs of different backgrounds, ensuring all imagery, text and ideas won't cause offence. Pupils must consider how their ideas can impact the world around them, particularly the impact of the creation of more e-waste across the world.

Equality, Diversity and Inclusivity Links

Aims Within the different projects we look to ensure that there is a broad range emphasising equality, diversity and inclusivity. We ensure that all students work together within pairs, groups and teams to strengthen professional relationships within the classroom and promote an acceptance for all students and the wider world around them.