

## Computer Science



Ada Lovelace(1815-1852)

“The Analytical Engine has no pretensions whatever to originate anything. It can do whatever we know how to order it to perform. It can follow analysis; but it has no power of anticipating any analytical relations or truths. Its province is to assist us to making available what we are already acquainted with.

[Describing Charles Babbage's machine.]”

# OCR Computer Science - H446

Welcome to Computer Science at A level. We are delighted you have chosen to study Computer Science at Newstead Wood School and look forward to meeting you in September. In this booklet you will find:

- Course Content
- Assessment details
- Bridging Work
- Wider learning resources

To prepare you for programming, we ask that you complete the Bridging Work over the summer and bring this to your first lesson in September. You will be assessed on your understanding of this Bridging Work early in the Autumn Term.

## Content overview

### Component 01: Computer systems

Students are introduced to the internal workings of the (CPU), data exchange, software development, data types and legal and ethical issues. The resulting knowledge and understanding will underpin their work in component 03.

It covers:

- The characteristics of contemporary processors, input, output and storage devices
- Types of software and the different methodologies used to develop software
- Data exchange between different systems
- Data types, data structures and algorithms
- Legal, moral, cultural and ethical issues.

### Component 02: Algorithms and programming

This builds on component 01 to include computational thinking and problem-solving.

It covers:

- What is meant by computational thinking (thinking abstractly, thinking ahead, thinking procedurally etc.)
- Problem solving and programming – how computers and programs can be used to solve problems
- Algorithms and how they can be used to describe and solve problems.

### Component 03: Programming project

Students are expected to apply the principles of computational thinking to a practical coding programming project. They will analyse, design, develop, test, evaluate and document a program written in a suitable programming language. The project is designed to be independently chosen by the student and provides them with the flexibility to investigate projects within the diverse field of computer science. We support a wide and diverse range of languages.

## **Assessment overview**

Students must take all three components to be awarded the OCR A Level in Computer Science.

### **Computer systems (01)**

Duration: 02 hours 30 mins Marks 140 Weightage : 40%

Content: The internal workings of the (CPU), data exchange, software development, data types and legal and ethical issues.

Calculators not allowed.

### **Algorithms and programming (02)**

Duration: 02 hours 30 mins Marks 140 Weightage : 40%

Content: Using computational thinking to solve problems.

Calculators not allowed.

### **Programming project (03)**

Marks 70 Weightage 20% Non-exam assessment.

Students will be expected to analyse a problem (10 marks), and design (15 marks), develop and test (25 marks), and evaluate and document (20 marks) a program. The program must be to solve it written in a suitable programming language.

## Bridging work

To help prepare you for Computer Science in Year 12 we would like every student to experience Python Programming. The link below will take you to series of YouTube videos covering a Python course which will prepare you for Year 12.

Code Camp Python Programming Course Assignment: This course will give you a full introduction into the core concepts in Python. Follow along with the videos and you'll be a Python programmer in no time!

<https://www.youtube.com/watch?v=rfscVS0vtbw>

- To complete this unit, you must **code all five projects included in the video course**. You should use Replit (online Python IDE) for this. Link: [Replit](#)
- Projects:
  1. Build a calculator - 52:37
  2. Build a Madlibs game - 58:27
  3. Upgrade the calculator - 2:00:37
  4. Build a guessing game - 2:52:41
  5. Build a multiple-choice quiz - 3:57:37

Submission of the task:

- Please create a Word document with the naming format YourFirstName\_YourLastName\_Year12bridgingunit. For example, John Stevens' file would be named John\_Stevens\_Year12bridgingunit.doc.
- In this Word document, include screenshots of your completed and annotated code for all five challenges, as well as the Replit links to the codes. Use a new Replit for each project.
- Be prepared to or submit your work via email by your first Computer Science lesson in September. Email your completed task to [jmehta@newsteadwood.co.uk](mailto:jmehta@newsteadwood.co.uk) with the subject line "Year 12 Bridging Unit 2024-25".

## Want to extend your learning?

If you wish to read ahead the curriculum, please go through the OCR course on Isaac Computer Science website.

[https://isaaccomputerscience.org/topics/a\\_level?examBoard=all&stage=all#ocr](https://isaaccomputerscience.org/topics/a_level?examBoard=all&stage=all#ocr)

For a broader understanding of computer science and related fields, you might find the following resources helpful:

### Podcasts

**Spark with Nora Young:** It is a podcast hosted by tech writer and speaker Nora Young. It covers a broad range of subjects, from basic programming concepts to cutting-edge AI technologies. The show not only provides essential knowledge but also examines the societal impacts of these advancements, offering listeners a deeper understanding through captivating interviews and discussions.

<https://www.cbc.ca/radio/spark>

**Programming throwdown:** The show covers diverse topics in programming, offering insights into the latest tech trends, tools, and techniques.

<https://www.programmingthrowdown.com/>

**Software Engineering Radio:** Aimed at those passionate about software engineering, this podcast offers deep insights into the latest technological advancements. With over 450 episodes, it serves as a key resource for professionals and students eager to understand the fast-paced evolution of the tech industry.

<https://se-radio.net/>

**Twit - This Week in Tech:** Hosted by Leo Laporte, this show features a roundtable discussion on high-tech trends, with a strong emphasis on key tech companies and innovations. It keeps listeners up to date on advancements in areas such as AI, cloud computing, and emerging technologies.

<https://twit.tv/>

**CS 50 Podcast:** The CS50 Podcast is hosted by CS50's own David J. Malan and Brian Yu at Harvard University. Each episode focuses on (and explains!) current events and news in tech and computer science more generally.

<https://open.spotify.com/show/3MxtKWdpXTVvxAYPDJuKV>

### Books

**Computer Science: An Overview** by J. Glenn Brookshear; Pearson, 2014. An introduction to computer science, presenting each topic with its history, current state,

and future potential, including ethical considerations. It's a comprehensive guide for students and professionals alike.

**Code:** The Hidden Language of Computer Hardware and Software by Charles Petzold; Microsoft Press, 2000. This book connects everyday objects like flashlights and seesaws to computers, demonstrating how human ingenuity has driven technological innovation. It's a must-read for anyone curious about the fundamentals of computing.

**The Pattern on the Stone:** The Simple Ideas That Make Computers Work by Daniel Hillis; Basic Books, 1999. It explains basic computer concepts in accessible language. This book simplifies the complexities of computer science for readers of all backgrounds.

**The Information:** A History, a Theory, a Flood by James Gleick; Fourth Estate, 2012. A chronicle of how information has become the defining quality of the modern era. Gleick's narrative intertwines scientific discoveries with their historical context.

**Outnumbered:** From Facebook and Google to fake news and filter-bubbles – the algorithms that control our lives by David Sumpter; Bloomsbury Sigma, 2018. An applied mathematician explores how algorithms use our data and affect our lives. Sumpter provides a critical analysis of our algorithm-driven world.

**Once Upon an Algorithm:** How Stories Explain Computing by Martin Erwig; MIT Press, 2017. This book explains computer science concepts using familiar stories like Hansel and Gretel, Sherlock Holmes, Groundhog Day, and Harry Potter. Erwig's storytelling approach makes complex ideas more relatable.

**Artificial Intelligence:** A Ladybird Expert Book by Michael Wooldridge; Michael Joseph Books, 2018. Written by our Head of Department, it traces the evolution of intelligent machines from Turing's ideas to modern digital assistants like Siri and Alexa. Wooldridge provides a succinct overview of AI's history and its current state.

**Computational Fairy Tales:** Jeremy Kubica; CreateSpace, 2012. This book offers a whimsical journey through computational thinking, illustrating core computer science concepts through fairy tales. It's a creative introduction for young students to the world of computing.

## Movies

**The Imitation Game:** This film is a true story during World War II. A British mathematician who is one of the pioneers in modern computers, Alan Turing, tries to decrypt the message contained in the Enigma machine. Alan Turing has been named the father of cryptography and the father of modern computers.

You can learn about cryptography, plain text, and ciphertext from this film. Besides that, what is also important is learning to understand what a Turing test is, a non-deterministic Turing machine and a deterministic Turing machine.

**Hidden Figures :** String link to computer science through its depiction of African-American women mathematicians and engineers who made significant contributions to NASA during the Space Race. The story highlights the work of Katherine Johnson, Dorothy Vaughan, and Mary Jackson, whose expertise in mathematics and computing was crucial for space missions. Their efforts in developing and implementing early computer programs and algorithms showcase the essential role of computer science in advancing technology and achieving monumental scientific milestones.

**The Social Dilemma:** This documentary on Netflix illustrates the profound impact of social media algorithms on human behaviour and society. It links to the computer science curriculum by showcasing real-world applications of data science, machine learning, and ethical computing, highlighting the importance of understanding algorithm design and its societal implications.

**The Social Network:** This film tells us about Mark Zuckerberg's journey in building Facebook. Not only that, there are many other sides of Mark Zuckerberg that we can observe in this film, including how he conflicts with the person who stole his data and with his co-workers. The film is set in Harvard.

**Snowden:** This film is a true story about Edward Snowden's journey as a worker at the National Security Agency. He realized that the United States government was spying on everyone through electronic devices to track and identify threats to the country. Snowden leaked this secret to the public and made him the most wanted fugitive

We look forward to welcoming you on the course in September.

Wish you a lovely summer break!

Mrs Mehta

Head of Computer Science