PREPARING TO STUDY

Computer Science

AT THE DEANERY

We are delighted that you are interested in studying Computer Science at the Deanery Sixth Form.

To be a great Computer Scientist you need to understand how computers work, the issues that surround them and have some programming skills. You will need to make sure that you also have a resilient mindset to solve the challenges that will be coming your way in September.

To help to prepare for the A-Level Computer Science course this booklet suggests a range of activities that will help to broaden your Computer Science knowledge and skills (along with testing your resilience along the way).

This booklet will focus on three main areas:

1. Course information
2. Your knowledge of how computers work and the issues that surround them
3. Problem solving and programming

1. COURSE INFORMATION

At the Deanery you will be studying AQA Computer Science. The course is broken down into three parts:

Paper 1

What's assessed?

This paper tests your ability to program, as well as theoretical knowledge of programming, data structures, algorithms and the theory of computation. You will also need to demonstrate your problem-solving skills.

The assessment

- On-screen exam: 2 hours 30 minutes
- 40% of your A-level grade

Questions

You will answer a series of short questions and write/adapt/extend programs in an Electronic Answer Document provided by the exam board.

You will be given Preliminary Material, a Skeleton Program (written in Python) and, where appropriate, test data, for use in the exam.

Paper 2

What's assessed?

This paper tests your theory knowledge in the following areas:

- Data representation
- Computer Systems
- Computer organisation and architecture
- Consequences of Computing
- Fundamentals of communication and networking
- Databases
- Big Data
- Functional programming

The assessment

- Written exam: 2 hours 30 minutes
- 40% of your A-level grade

Questions

You will answer a series of compulsory short-answer and extended-answer questions.

Non-exam Assessment

What's assessed?

This will test your ability to use the knowledge and skills gained through the course to solve or investigate a practical problem. You can choose your own project but will be expected to follow a systematic approach to problem solving (analysis, design, technical solution, testing and evaluation).

The assessment

- NEA report, program and testing videos.
- 20% of your A-level grade

You can find a link to the full specification here:

https://www.aqa.org.uk/subjects/computer-science-and-it/as-and-a-level/computer-science-7516-7517/specification-at-a-glance

2. DEVELOPING YOUR KNOWLEDGE OF HOW COMPUTERS WORK AND THE ISSUES THAT SURROUND THEM

Below you will find suggested websites, books, podcasts, documentaries and even some films that you can watch to gain a greater understanding of how computers work and the issues that surround them in the wider world.

Websites

BBC Click - BBC World News - Click - Episode guide

A comprehensive guide to all the latest gadgets, websites, games and computer industry news.

Click is the programme for everyone interested in the internet and new media. Whether it's e-commerce, new developments and products, or gadgets and games, Click looks at the tools that will revolutionise business and personal life.

Wired Technology - Technology Latest News and Features | WIRED UK

The latest tech news from WIRED on giants like Apple and Google, and the most important technology issues of the day.

Isaac Computer Science - [A level topics — Isaac Computer Science]

A website with dedicated notes and quizzes relating to the A-Level Computer Science specification.

We would recommend reading the following sections to start:

- *Data Representation*
- *Boolean Logic*
- *Systems*
- *Networking*

Future Learn Online Courses

https://www.futurelearn.com/subjects/it-and-computer-science-courses

Lots of free courses on areas of Computer Science that you may want to find out more about e.g. AI, robotics, games development, cyber security and much more.

Podcasts

The Machine: A computer science education podcast

Faculty and students from Waterford Institute of Technology explore a wide range of topics related to computing and technology. Hosted by Rob O'Connor.

What the tech?

A podcast powered by the Computer Science Department at UCalgary. Here to deconstruct complex computer science concepts, bit by bit, and explain What the Tech is going on?!

Deep Questions

Cal Newport is a computer science professor and the New York Times bestselling author of Digital Minimalism and Deep Work. He writes about technology and the way it can both support and impede our efforts to live more meaningful, productive lives.

Lemon Bytes – Computer and Data Science

Conversations about Computer science and other aspects around it. Hosted by Sathvik Katam who learns most new things about computers by talking to his friends and colleagues who are in the tech field. This podcast happened when he hit record on those conversations and curated the highlights.

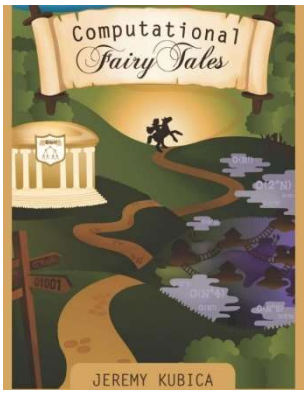
Byte Size – Conversational Computer Science

Computers might be boxes of magic rocks, but they should not be mystical. Byte Size is a conversational course in computer science. We will chat about fun topics and teach core concepts in computing in a way that is palatable regardless of your background. Join our conversation and you will be able to call yourself a computer scientist, too.

Books

Computational Fairy Tales (Kubica, J. 2012)

This book introduces principles of computational thinking, illustrating high-level computer science concepts, the motivation behind them and their application in a non-computer-fairy tale-domain. It's a quest that will take your from learning the basics of programming in a blacksmith's forge to fighting curses with recursion.



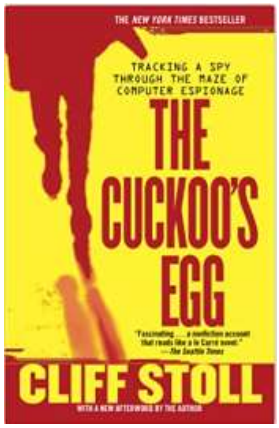
Artificial Intelligence: A Ladybird Expert Book (Wooldridge, M. 2018)

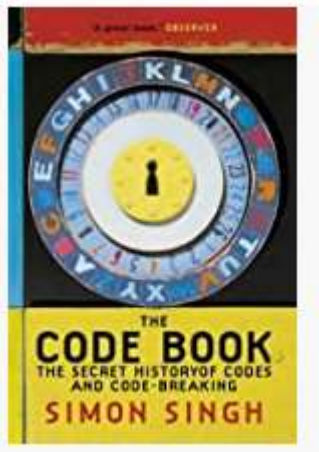
Artificial Intelligence chronicles the development of intelligent machines, from Turing's dream of machines that think, to today's digital assistants like Siri and Alexa.
AI is not something that awaits us in the future. Inside you'll learn how we have come to rely on embedded AI software and what a world of ubiquitous AI might look like.
This book covers:

- The British mathematician Alan Turing
- Can machines 'understand'?
- Logical and Behavioural AI
- The reality of AI today
- AI tomorrow
- And much more . . .

The Cuckoo's Egg (Stoll, C. 2005)

Before the internet became widely known as a global tool for terrorists, one perceptive U.S. citizen recognised its ominous potential. Armed with clear evidence of computer espionage, he began a highly personal quest to expose a hidden network of spies that threatened national security. But would the authorities back him up? Cliff Stoll's dramatic first-hand account is a "computer-age detective story, instantly fascinating and astonishingly gripping".





The Code Book: The Secret History of Codes and Code-breaking (Singh, S. 2002)

The Code Book is a history of man's urge to uncover the secrets of codes, from Egyptian puzzles to modern day computer encryptions. Simon Singh brings life to an astonishing story of puzzles, codes, languages and riddles that reveals man's continual pursuit to disguise and uncover, and to work out the secret languages of others.

Documentaries

BBC iPlayer

Bad Influencer: The Great Insta Con

The shocking story of social media wellness star Belle Gibson

Bodyhack: Metal Gear Man

James Young lost an arm and leg in a train accident and is now becoming part cyborg using new technology.

The Instagram Effect

How Instagram became the dominant force it is today, told by those on the inside.

Secrets of an ISIS Smartphone

The extraordinary story of a phone used by three British men who joined ISIS in Syria.

Trump in Tweets

Examining how Trump used Twitter to change the face of US politics.

Netflix

The Social Dilemma

This documentary-drama hybrid explores the dangerous human impact of social networking, with tech experts sounding the alarm on their own creations.

The Great Hack

Explore how a data company named Cambridge Analytica came to symbolise the dark side of social media in the wake of the 2016 U.S. presidential election.

Inside Bill's Brain: Decoding Bill Gates

Take a trip inside the mind of Bill Gates as the Billionaire opens up about those who influenced him and the audacious goals that he's still pursuing.

Print the Legend

This award-wining, original documentary chronicles the race for market leadership in 3D printing, the next age of technological evolution.

Trust No One: The Hunt for the Crypto King

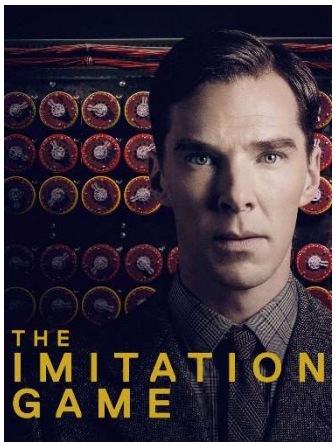
An impossibly bizarre story of greed and deception amid the high-stakes world of cryptocurrency.

The Billion Dollar Code

A series based on the true story behind the invention of the Google Earth algorithm.

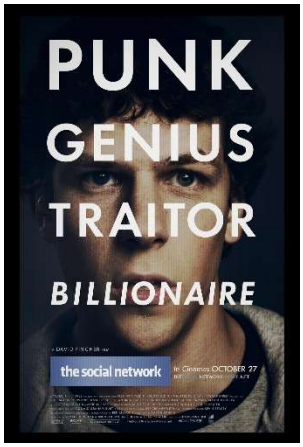
Films

The Imitation Game



Drama Thriller During World War II, the English mathematical genius Alan Turing tries to crack the German Enigma code with help from fellow mathematicians while attempting to come to terms with his troubled private life.

The Social Network



As Harvard student Mark Zuckerberg creates the social networking site that would become known as Facebook, he is sued by the twins who claimed he stole their idea, and by the co-founder who was later squeezed out of the business.

Snowden

The NSA's illegal surveillance techniques are leaked to the public by one of the agency's employees, Edward Snowden, in the form of thousands of classified documents distributed to the press.

3. PROBLEM SOLVING AND PROGRAMMING

To be a great Computer Scientist you need to be able to break problems down and solve them. This is a skill that you can't have enough practice of and will be an essential foundation for you when developing your programming skills.

This section will provide you with activities to practice your problem-solving skills along with your Python programming.

Problem Solving Puzzles

GCHQ Puzzles

https://www.gchq.gov.uk/section/news/puzzles

Try out a range of puzzles from the UK's intelligence, security and cyber agency.

General Puzzles

https://en.wikibooks.org/wiki/Puzzles

Alan Turing Cryptography Competition
https://www.maths.manchester.ac.uk/cryptography_competition/

Try out the previous year's competitions and check whether you managed to crack the code.

Python Programming

How to think like a Computer Scientist -
http://openbookproject.net/thinkcs/python/english3e/index.html

One of the best free books on learning to program using Python. The emphasis is on understanding why we write code and solve problems in a particular way, which will be important for your A-Level course. Chapters 1-14 cover AS and the rest of the book covers the A-Level topics if you want to get a head start.

Invent with Python

http://inventwithpython.com/

This website has a collection of introductory books on writing code that are all free.

Each chapter has a game (or similar) to make and includes the full code, plus a step-by-step walkthrough of how to make it. It is a good exercise to read code before you write it, so making some of these games will be useful for you before you start your course.

Python Tutorials

https://www.w3schools.com/python/python_syntax.asp

A wide range of interactive tutorials to teach you pretty much anything you might need to know how to do using Python.

Programming Challenges

The British Informatics Olympiad

https://www.olympiad.org.uk/problems.html

Lots of difficult programming challenges if you are up for an extra challenge, it is like the maths Olympiad but for programming. The Mayan Calendar is a good challenge to start with.

Practice Python

https://www.practicepython.org/

Lots of different Python challenges for you to try that come with working solutions.

YouTube Channels

Craig N Dave

https://www.youtube.com/c/craigndave/playlists?view=50&sort=dd&shelf_id=7

This YouTube channel is run by two Computer Science teachers and has a video for every topic in both the AS and A-Level specification.

Mr Brown CS

https://www.youtube.com/channel/UCsBxhDfwURg-vQASN2ZeHwg?cbrd=1

This is YouTube channel that is run by a UK computer science teacher which covers a large number of topics at both GCSE and A-level.

Computerphile

https://www.youtube.com/user/Computerphile

A wide range of Computer Science videos from the University of Nottingham. Great to use if there are some topics that you want to delve a little deeper into.

Computer Science Crash Course

https://www.youtube.com/watch?v=tpIctyqH29Q&list=PL8dPuuaLjXtNlUrzyH5r6jN9ulIgZBpdo&index=1

A set of crash courses in a wide range of Computer Science topics.

ANY QUESTIONS?

We look forward to welcoming you onto the A-Level Computer Science course but if you have any questions in the meantime please feel free to e-mail us.

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