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A guide to help you get ready for A level Computer Science

What is Computer Science?

This pack contains a programme of activities and resources to prepare you to start an A-level in Computer Science in September. It is aimed to be used now and throughout the remainder of the summer term and over the summer holidays to ensure you are ready to start your course in September. The suggested activities will start to engage with and enjoy the world of Art! It's a fantastic subject to study, and we hope you enjoy your learning.

If you need any clarification or find another amazing resource, do get in touch!

GaynerJ@chichester.ac.uk

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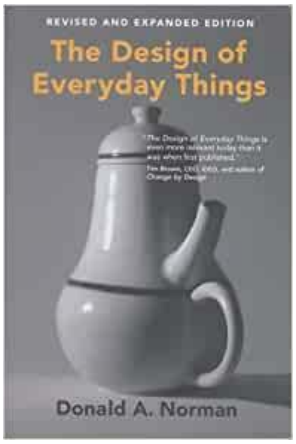
Read Computer Science Based Books

These books are all popular books about Computer Science and great for extending your knowledge and understanding.

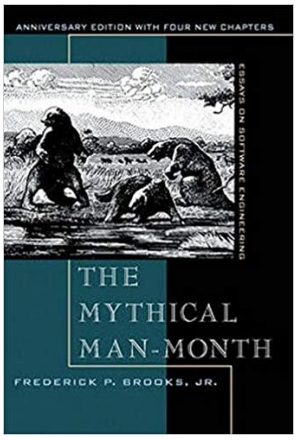


Title: The Design of Everyday Things

Author: Donald Norman

This book is not a technical read, with no programming elements being discussed, but it is an absolute must read for anyone that is going to be looking to design software (or anything else) for any user group.

A previous version of this book is also available on YouTube if you would want to listen instead: https://bit.ly/3dAY37Y

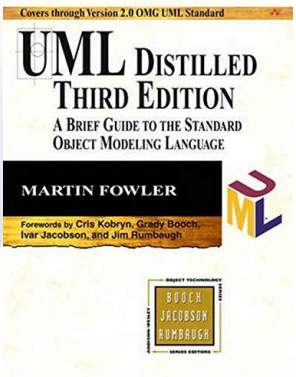


Title: The Mythical Man-Month

Author: Frederick Brooks

Although now a little dated in a number of examples, this book is an excellent source of numerous short essays on software design issues and problems that have been encountered.

A stunning glimpse back into how software development processes were, and how things have changed over years. I would suggest paying closer attention to the lessons learned about the ‘Silver Bullet’.



Title: UML Distilled: Third Edition

Author: Martin Fowler

With UML (Unified Modelling Language) being one of the most used manners of standardising systems design, and UML 2 being the most current format, this book will help to guide you through some of the most commonly used diagrams and design forms used in industry and in academia today.

These are numerous books you could read. There are great books available on audible, kindle too. Choose anyone that takes your fancy! Write a book review on it and hand this to your teacher in September.

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The number of books available on the subject of Computer Science is enormous. The following books are amongst those recommended by the Department of Computer Science at the University of Oxford.

Computational Fairy Tales by Jeremy Kubica; CreateSpace, 2012. A romp through the principles of computational thinking, illustrating high-level computer science concepts, the motivation behind them, and their application via the medium of a fairy tale. Aimed at secondary school students. "Bonkers, but very enjoyable."

Artificial Intelligence: A Ladybird Expert Book by Michael Wooldridge; Michael Joseph Books, 2018. Written by our Head of Department, this book "…chronicles the development of intelligent machines, from Turing's dream of machines that think, to today's digital assistants like Siri and Alexa."

Once Upon an Algorithm: How Stories Explain Computing by Martin Erwig; MIT Press, 2017. Concepts in Computer Science explained through familiar stories such as Hansel and Gretel, Sherlock Holmes, the movie Groundhog Day, and Harry Potter.

Computer Science: An Overview by J. Glenn Brookshear; Pearson, 2014. Overview of what computer science is all about: each topic is presented with its historical perspective, current state, and future potential, as well as ethical issues.

Code: The Hidden Language of Computer Hardware and Software by Charles Petzold. Microsoft Press, 2000. "What do flashlights, the British invasion, black cats, and seesaws have to do with computers? ...see how ingenuity and our very human compulsion to communicate have driven the technological innovations of the past two centuries."

The Pattern on the Stone: The Simple Ideas That Make Computers Work by Daniel Hillis; Basic Books, 1999. Explains the basic concepts of the computer in everyday language.

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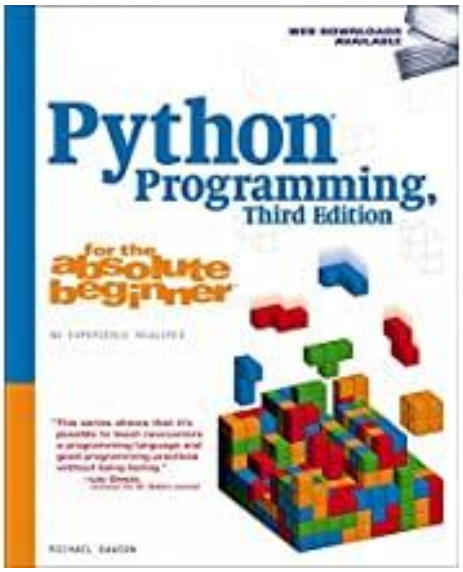
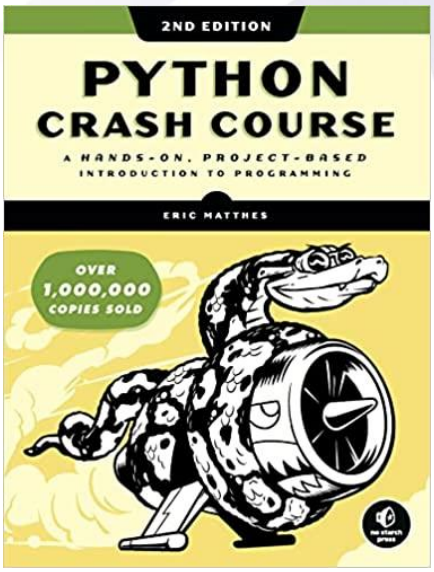
In addition, I recommend that you make use of a book that will help you to learn how to program in Python. Again, there are a very large number of books on this topic, not to mention a vast number of websites. Two books that cover this topic very well are:

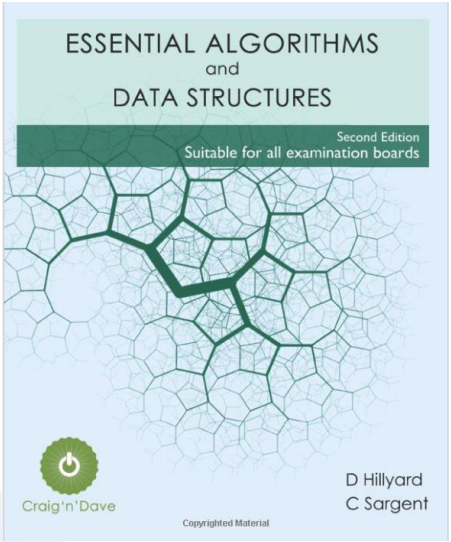


Python Programming for the absolute beginner by Michael Dawson



Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction To Programming by Eric Matthes

Another useful book is:



Essential algorithms and data structures: Suitable for all exam boards by David Hillyard and Craig Sargent

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TED Talks

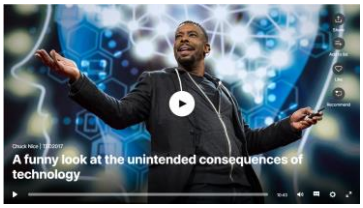
Download the TED talk app to your device. It's brilliant!!!

Talks on Computer Science thoughts and perspectives

Tom Griffiths
3 ways to make a better decisions – by thinking like a computer

https://bit.ly/3eGmctQ

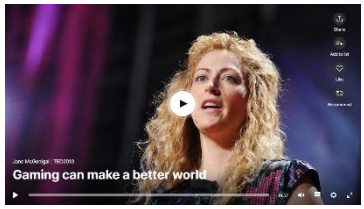
How we can implement more effective decision-making techniques in everyday life.



Chuck Nice
A funny look at the unintended consequences of technology

https://bit.ly/2z0JdZa

A fresh perspective on a number of issues and concerns within the realm of computer science.



Jane McGonigal
Gaming can make a better world

https://bit.ly/2zQsics

A strong case for all of us to play games and to exponentially spend more time doing so for the sake of the world!

Videos to help with recapping some material covered previously

David Malan
What's an algorithm?

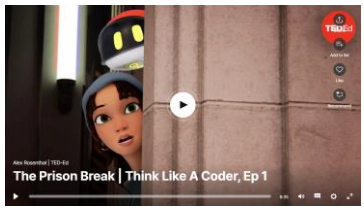
https://bit.ly/3czjZ1P

A break down of what an algorithm is, and how a simple counting issue could be perceived as an

José Américano N L F de Freitas
How exactly does binary code work?

https://bit.ly/3dzgr0H

Break down of how binary is used within a computer in



Alex Rosenthal
The Prison Break | Think like a code, Ep 1

https://bit.ly/2A2w9D3

The first in a series of ten videos that show how everyday tasks we do can

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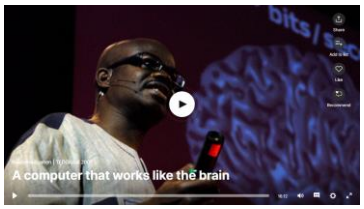
algorithm and made even more efficient.

order to execute instructions, store data, and play media.

be translated to instructions for a computer to follow.

Talks on the futures of technology



Kwabena Boahen
A computer that works like a brain

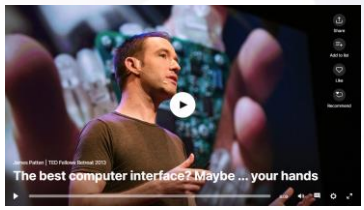
https://bit.ly/3eLQV8M

Understanding how the human brain works, could be the key to making computers work much more efficiently.

John Underkoffler
Pointing to the future of UI

https://bit.ly/3cxya7A

Fascinating talk on the future of User Interface and using 3D controlling systems to manipulate computers in real time, from the consultants for Minority Report.

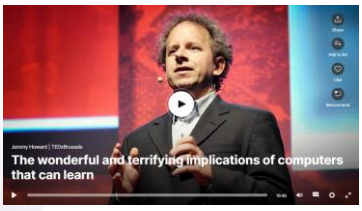


James Patten
The best computer interface? Maybe … your hands

https://bit.ly/3dzail8

How creative expression can guide the future of computer interaction design using the physical environment.

Talks on Machine Learning and Artificial Intelligence



Jeremy Howard
The wonderful and terrifying implications of computers that can learn

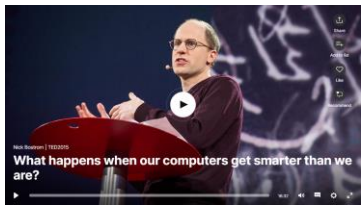
https://bit.ly/3ePJXjg

Very strong talk on the implementations and applications of machine learning in everyday life.

Shyam Sankar
The rise of human-computer cooperation

https://bit.ly/3eRuT4m

Talk on the symbiotic relationship between machines and humans to solve the biggest problems in the world.



Nick Bostrom
What happens when our computers get smarter than we are

https://bit.ly/3cypzSb

In depth discussions on the implications and concerns regarding computers as they become more intelligent.

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If these links don’t work, you will find these easily with a google search using TED talk and the name of the speaker.

Complete a summary of at least two of the talks using the Cornell note making format on explained on the next page.

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Effective Note Making

Making effective notes in lessons is an essential skill for A-level Computer Science. Practice producing notes using the Cornell System by summarising two of the TED talks you have listened to. Complete your notes in the following format and show them to your teacher when you start your course in September.

<table>
<tr><td colspan="2">SUBJECT TOPIC

DATE</td></tr>
<tr><td colspan="2">LESSON FOCUS</td></tr>
<tr><td>QUESTIONS AND CUE-WORDS</td><td>NOTE TAKING

1. Record: During the lecture, use the note-taking column to record the lesson using concise sentences and abbreviations.

2. Questions: As soon after class as possible, write questions in the left hand column based on the notes in the note taking column. Writing questions helps to clarify meanings, reveal relationships, establish continuity, and strengthen memory. Also, the writing of questions sets up a perfect stage for exam studying later.

3. Recite: Cover the note-taking column with a sheet of paper. Then, looking at the questions or cue-words in the question and cue word column only, say aloud, in your own words, the answers to the questions, facts, or ideas indicated by the cue-words.

4. Reflect: Reflect on the material by asking yourself questions, for example: “What’s the significance of these facts? What principle are they based on? How can I apply them? How do they fit in with what I already know? What’s beyond them?

5. Review: Spend at least ten minutes every week reviewing all your previous notes. If you do, you’ll retain a great deal for current use, as well as, for the exam.</td></tr>
<tr><td colspan="2">SUMMARY

After class, use this space at the bottom of each page to summarize the notes on that page.</td></tr>
</table>

Adapted from: How to Study in College 7/e by Walter Pauk, (2001) Houghton Mifflin Company

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Topics to Research

Abstraction this is a small topic in Unit 2

Within computing, abstraction can take on many different forms and guises within the scope of Object-Oriented Programming, abstraction is one of the central concepts and is often also has similar principles to that of encapsulation but is one of design rather than implementation.

This concept is used frequently across higher level languages, especially those that deal with libraries and procedural calls.

https://www.geeksforgeeks.org/difference-between-abstraction-and-encapsulation-in-java-with-examples/

Big Data – this is a topic in Unit 12

Big Data is the general term that is used for large subsets of data that have been collected from any number of different sources. This form of data always tends to follow the three V's; the vast **V**olume of the data that is being collected, the high levels of **V**elocity that the data is received, and the **V**ariety of data collected.

With so much attention given to Big Data, and the exponentially growing industry that focuses around the collection, passage, and security of this data it is no wonder that there is such a huge focus on it. This can be seen following the ideals of GDPR and other such legal aspects.

https://www.oracle.com/uk/big-data/what-is-big-data.html

SQL (Structured Querying Language) - this topic relates to Unit 11 Relational Databases

SQL is the go-to database language and has stood the test of time, still being used in industry 40+ years since its first inception within IBM. Over time more companies are changing over to more non-relational forms of database structure in order to cope with the ever-increasing demands of Big Data (NoSQL).

A great starting point is the simple tutorials that are available on W3 Schools: https://www.w3schools.com/sql/sql_intro.asp

After that explore further developing your knowledge of the concepts of relational databases by reading what Oracle (industry leaders) say on the topic:

https://www.oracle.com/uk/database/what-is-a-relational-database/

https://blogs.oracle.com/database/what-is-oracle-nosql-database

Make summary notes on the material.

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Online Learning Courses

A Massive Open Online Course (MOOC) is an interactive step-by-step course aimed at reaching an unlimited number of participants worldwide to create a community of lifelong learners. There are many different MOOC providers that cover a huge variety of different subject and topic interests.

Typically a MOOC will involve 2-3 hours study per week for 6 weeks or so. MOOCs are free of charge. All required course materials will be provided for you online, which is also 100% free! Each course is open to anyone with internet access across the world and all you need is your wonderful brain!

Here are a few that you may wish to try:

Both of these topics are discussed in both years of the course and further knowledge and understanding would prove to be very beneficial to you entering into the Computer Science disciplines.

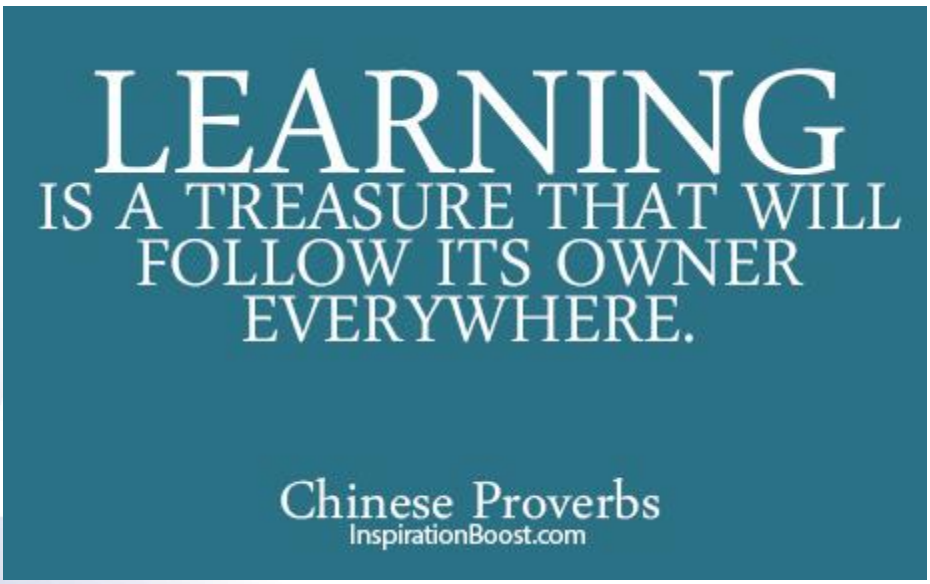
Cybersecurity and the Internet of Things via Coursera

https://www.coursera.org/learn/iot-cyber-security

Applied AI with DeepLearning

https://www.coursera.org/learn/ai

Follow the course learning instructions & complete all tasks, keep a record of what you do and save all work as evidence of your learning.



Good luck!