

Transitioning to A Level Computer Science

AS Overview

Many of the topics you covered in the GCSE are repeated in AS Computer Science. In many cases the basic knowledge you need will be roughly the same but we go into more depth and breadth.

Example 1: sorting algorithms - Bubble sort, Insertion sort and **Quick sort**

Example 2: logic gates - AND, OR, NOT, **XOR, NAND, NOR**

Here is a list of topics for AS (Year 12):

Unit	Description
1	CPU Structure and Function - this goes into more depth on computer and CPU architectures
2	Types of Processor - You learn about RISC processors and pipelining
3	Input Output and Storage - this does not go very far beyond the GCSE content
4	Systems software - this does not go very far beyond the GCSE content
5	Software development - Exploring different types of software development methodologies such as Waterfall, Spiral and Agile.
6	Types of programming language - comparing and using procedural languages (like Python), OO languages (like Java) and low level languages such as assembly language.
7	Databases - the structure and function of databases including SQL and the 3 normal forms
8	Networks - more depth and breadth building on the GCSE content
9	Web technologies - HTML, web servers and how web based systems work

10	Data types - data representation, binary and hexadecimal, two's complement, real numbers in binary
11	Boolean algebra - mathematical notation and algebra problem solving for boolean logic
12	Computer related legislation - same as GCSE
13	Thinking abstractly - how to approach the abstraction and decomposition needed to produce a computer based solution
14	Algorithms (AS) - bubble sort, insertion sort, quick sort, linear search, binary search, using queues and stacks, Dijkstra's shortest path

Articles for first 3 weeks

Here is a list of useful articles which will ease your transition into A level and give you an idea of the level of breadth and depth required to succeed.

<https://www.freecodecamp.org/news/object-oriented-programming-concepts-21bb035f7260/>

<https://intelligence.org/files/EthicsofAI.pdf>

<https://www.synopsys.com/blogs/software-security/top-4-software-development-methodologies/>

<https://www.youtube.com/watch?v=GazC3A4OQTE>

Preparation for your Project

You will prepare a programming project where you can choose your own topic. This counts for 20% of the marks. This commences in Y12.

Therefore, a considerable portion of your time will be spent practising programming in the language of your choice. You learn Java but you can use any language you want for your own programs.

To gain the highest marks in the project you need to incorporate Object Orientation and incorporate some of the algorithms and data structures you learn at A level into the project in some way.

Here is a primer for OO (Object Orientation) :-

https://www.w3schools.com/java/java_oop.asp

Here is a list of links to the algorithms and data structures :-

Bubble sort -

<https://www.w3schools.in/data-structures-tutorial/sorting-techniques/bubble-sort-algorithm/>

Insertion sort -

<https://www.w3schools.in/data-structures-tutorial/sorting-techniques/insertion-sort-algorithm/>

Binary search -

<https://www.w3resource.com/python-exercises/data-structures-and-algorithms/python-search-and-sorting-exercise-1.php>

Dijkstra's shortest path -

https://www.bogotobogo.com/python/python_Dijkstras_Shortest_Path_Algorithm.php

A* algorithm -

<https://medium.com/@nicholas.w.swift/easy-a-star-pathfinding-7e6689c7f7b2>

Queues -

<https://www.w3schools.in/data-structures-tutorial/queue/>

Stacks -

<https://www.w3schools.in/data-structures-tutorial/stack/>

Linked list -

<https://www.w3schools.in/data-structures-tutorial/linked-list/>

Links to virtual/social media - conferences/podcasts/tv shows etc

The A level includes Ethical Moral and Cultural units. You will need to read around this topic and build up a deep understanding over time in order to be able to approach this topic in exams.

There are a number of futuristic TV shows and films which deal with technology, artificial intelligence and the ethics around this.

Here are some suggestions:

Mr Robot series 1

https://en.wikipedia.org/wiki/Mr._Robot

Black Mirror - many of these stand alone episodes present a futuristic society where privacy and individuality has been eroded by social media and also how crime might be committed in the future due to tech developments.

https://en.wikipedia.org/wiki/The_Entire_History_of_You

[https://en.wikipedia.org/wiki/Nosedive_\(Black_Mirror\)](https://en.wikipedia.org/wiki/Nosedive_(Black_Mirror))

[https://en.wikipedia.org/wiki/Shut_Up_and_Dance_\(Black_Mirror\)](https://en.wikipedia.org/wiki/Shut_Up_and_Dance_(Black_Mirror))

https://en.wikipedia.org/wiki/Hated_in_the_Nation

https://en.wikipedia.org/wiki/USS_Callister

[https://en.wikipedia.org/wiki/Arkangel_\(Black_Mirror\)](https://en.wikipedia.org/wiki/Arkangel_(Black_Mirror))

There are also many youtube videos exploring these issues :-

Why privacy matters - <https://www.youtube.com/watch?v=pcSlowAhvUk>

Future of personal data - <https://www.youtube.com/watch?v=Jlo-V0beaBw>

Hacking - <https://www.youtube.com/watch?v=hqKafI7Amd8>