PA Curriculum draft - Computer Science, programming and Web development

Basic Syllabus

Pre GCSE - foundation for exams
- Binary, hexadecimal and other counting systems
- Programming - I strongly recommend python as it is the most suited to the work you would have to do for coursework and exams. You don't need to have many skills, you just need to practice building basic programs which do different things. Python also has lots of future potential, when I was at school we heard about a 14 year old who wrote a python program which dumped a load of users data (names, passwords, addresses etc.) onto his computer which proves it is a powerful language.
- A bit of HTML could be useful

Pre GCSE - additional - in decreasing order of relevance to pure computing
- HTML, CSS - used to build websites, you don't need anything complicated at this stage. Just practice building web pages, don't spend too much time on this if you are planning on doing exams as you have other work to do
- Arduino computers - you can either buy one for about £25, and some accessories so your computer can control things or you could easily build one (complete with accessories) for less than £20 easily using tutorials off the internet

GCSE
- Get more practice at python, get used to using more complicated functions and structures
- Computer networking protocols and basic encryption (TCP/IP and caesar cypher)
- input/output devices (e.g. mice, keyboard, 2d and 3d printers and basic explanations of how they work)
- If you haven't already, get good at the basics of HTML
- This is a non exhaustive list, there will be more things in your exam/coursework but you need to find this in your exam syllabus.

GCSE - additional
- Add in Javascript to the HTML/CSS knowledge base for calculations on the website
- Also start learning Java syntax as this can be used to make apps and program servers (python can also be used for this)
- Try and build more advanced projects with your arduino, e.g. radio controlled cars, planes etc

A level
- Get good enough at Java, javascript and python as these languages will come up alot in the exam

- Half the exam is on physical infrastructure, so you might want to build a cheap server then build programs/other physical infrastructure so you can understand how everything works. I recommend doing this about 4 months before the planned exam date.

A level - additional
- If you want to do engineering at university, you might want to start learning MATLAB. Some people might want to learn how to do it earlier, whilst some might want to learn it over the summer before they go to university. Unfortunately, you have to pay for the software (£59 for student edition) but if you wait until you reach university, you should be able to get it for free through the university as they will have a special license for it. MATLAB is a primitive programming language similar to python but is designed to minimise your work requirement to perform good mathematical analysis. It also has lots of pre-programmed constants which are important (e.g. pi). You will end up using it in a maths or engineering degree anyway, and when you have the option of using it you can get much more marks by doing so.
- I dont think you need to specifically learn Matlab, I started learning the syntax in the november of my first year at university and the syntax really threw me off at first, but you get used to it over time as with most languages.

Resources

Pre gcse content
- https://www.youtube.com/watch?v=HBxCHonP6Ro&list=PL6gx4Cwl9DGAcbMi1sH6oAMk4JHw91mC python tutorials, you shouldnt need to go beyond tutorial 20
- https://automatetheboringstuff.com/ more python resources - no need to go beyond chapter 8 at this stage
- https://www.youtube.com/results?search_query=binary+and+hexadecimal binary and hexadecimal number systems - up to the student to find which one they learn best from
- ASCII - https://www.techonthenet.com/ascii/chart.php#:~:text=ASCII%20(which%20stands%20for%20American,symbols%20in%20the%20character%20set. This counting system is used in our computers, and allows different characters to be displayed. DO NOT TRY AND PERFORM MATHS USING THESE CHARACTERS WITHOUT EXTRA PROCESSING AS YOUR RESULT WILL BE WRONG
- Also see the extra bit I have sent over

Gcse (meant to be 14-16, but could probably be done to a good standard from about 12 years old)
- I can't see you needing to go past tutorial 23 on youtube, but you can if you want. I don't imagine you will need to progress any further on the other website
- Keep practicing building programs, but this time see if you can think of any that you might want to do yourself.
- https://www.youtube.com/watch?v=4IYs-B0lwhw&list=PLC1322B5A0180C946&index=19 html and CSS - you need to be able to

understand all the code up to tutorial 19 so if you are asked what a piece of code does in the exam, and you probably need to be able to do up to tutorial 19 open book. You also need to be able to program most of it closed book, except images.

- https://www.youtube.com/watch?v=P_9z5XN5gT4 SLS 3d printing
- https://www.youtube.com/watch?v=WHO6G67GJbM FDM 3d printing, you can get cheap ones on the internet (Prusa and Creality Ender) although you should think about what you would build with it if you got one.
- You will need to do other things for the exam, and this will depend on your exam but the high return on investment point is programming although binary and hexadecimal are both important

A level
- You probably need to be able to do the youtube tutorial series up to at least 40, if not further
- Work to about tutorial 25 on this series for javascript too
  https://www.youtube.com/watch?v=yQaAGmHNn9s&list=PL46F0A159EC02DF82
- https://www.youtube.com/watch?v=SsFm2YtfOPA arduino server basics
- https://www.youtube.com/watch?v=vzojwG7OB7c raspberry pi server basics