Virtual FC Tours: Teacher Toolkit

We can't wait to introduce your students to the incredible technology and people who make Amazon possible. Built for teachers and by teachers, we hope these instructional materials set you and your students up for success before, during, and after the virtual tour. Enjoy and we'll see you soon!

Step 1: Register

- **Register** with your students for a tour on our website. See the FAQ section for more details.
- **Distribute unique remote learner links** to students who are watching from home. You should receive these within 24-48 hours after registration. Use the provided template to assign links. (Excel or Word file here)

Step 2: Familiarise Yourself with the Tour:

Want to know what your students will learn? Check out the following resources to familiarise yourself with the tour.

- **Key Student Outcomes:** Discover the key vocabulary and outcomes covered on the tour by tour stop.
- **Interactive Video Recording:** Preview the tour or use the interactive video for classes that can't make the tour times. You can also share and assign the tour in Edpuzzle to track progress.
- **Standards Alignment:** The tour is aligned to the education standards across each of the nations of the UK.
- **Firewall Check:** Check your access (and your students' access) to GoToWebinar using this system test. If there is an issue, send the Firewall Configurations to your network manager. See here for more information.

Step 3: Prepare Your Students

Get your students excited and prepared for the tour! These optional resources will set your students up for a great experience. Be sure to distribute graphical organisers at this point.

- **Recommended - Before-the-Tour Slide Deck:** Activate students' prior knowledge and set expectations for the tour. We recommend allocating 20 minutes to review these slides the day before the tour. (PPT file here)
- **Optional — Amazon Cyber Robotics Challenge (Years 4-13):** In this 3-hour virtual challenge, students learn the basics of computer science while discovering how Amazon delivers goods. Create an account and register students using your class code.
- **Optional — Build Your Own Vocabulary List (Years 7-13):** Allow your students to preview the vocabulary that will be introduced by researching new terms on their own before the tour. (Word file here)

Step 4: Attend Your Virtual Tour

During the tour, we recommend providing students with a printed graphical organiser to capture their knowledge and questions. If students are remote, have students recreate the organiser on paper to avoid toggling between windows. Distribute your favourite one the day before the tour.

- **Tour Stop Organiser:** Students record the coolest fact learned and any questions at each stop. (Word file here)
- **3, 2, 1 Organiser:** A simple organiser to take notes on key questions instead of by tour stop. (Word file here)

Step 5: Celebrate Completing the Tour

- **Student Certificate:** Print and distribute student certificates to celebrate completing the tour!

Step 6: Extend Student Learning

- **Class Discussion Questions:** Reflect with your students using these discussion questions. (Word file here)
- **Dissect the SLAM Algorithm (Years 7–13):** Use flowcharts or pseudocode to try to break down the SLAM algorithm as a class. (Word file here)
- **Class Chats (Years 6–13):** Bring an Amazon employee to your class for a virtual career talk!
- **Amazon Cyber Robotics Challenge (Years 4–13):** In this free, 3-hour virtual challenge, students learn the basics of computer science while discovering how Amazon delivers customer goods. Create an account, register students using your class code, and enjoy!

Key Student Outcomes:

Tour Objective:

Students will be able to learn how computer science, engineering, and people work together to fulfil customer orders at Amazon. Students will also be able to meet and hear about the careers of three engineers who enable this technology.

Key Vocabulary:

The following vocabulary will be introduced in audio and visual format during the tour:

- **Algorithm:** a set of instructions or rules that a computer follows to perform a task.
- **Cloud Computing:** The delivery of technology resources—including computing, storage, databases, networking, and intelligence—through the Internet.
- **Sensor:** a device that detects and responds to its physical environment.
- **Efficiency:** the ability to reduce or eliminate waste in a process.
- **Database:** an organised collection of structured information, or data, typically stored electronically in a computer system.
- **Quality Control:** A process used to ensure that product or service is free from error.
- **Machine Learning:** The science of getting computers to perform or make predictions based on examples or past experience.
- **Hardware:** the physical parts of a computer or device (stuff you can touch).
- **Software:** collection of instructions and data that tell the computer how to work (the code!).

Key Concepts by Tour Stop:

Below is an outline of the tour's key outcomes by tour stop. Each tour stop starts with an interactive question. The tour guide reveals the answer and explains how it relates to a specific computer science term. The tour guide will then provide real-life context of how this computer science concept shows in the fulfilment process.

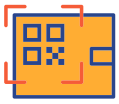
Note: If you are looking for a recording of the entire tour, see here.

Stop:	Interactive Questions:	Computer Science Concepts and FC Context Summary:
Welcome (0-6 min) 	**1) Who's here, and where are you from? Please add your loaction and year group to the chat.**	The tour guide will give an overview of the tour and set expectations.
Order (6-10 min) 	**2) How long was the fastest recorded Amazon delivery (from order to doorstep)?** **a.** 3 minutes **b. 30 minutes** **c.** 1 hour **d.** 3 hours	**Algorithms** are a set of instructions or rules that a computer follows to perform a task. **Algorithms** decide what fulfilment centre should process your order. The algorithm first looks at which fulfilment centres have your item(s) and then selects the one that is closest. Watch the included animated video here.

Key Student Outcomes:

Stop:	Interactive Questions:	Computer Science Concepts and FC Context Summary:
Pick (10-20 min) 	**3) How does Amazon organise and store items in each fulfilment centre?** **a.** Alphabetically by name **b.** By their purpose (cleaning supplies, art supplies, sports items, clothes, etc). **c.** By their colour (orange items, green items, blue items). **d. Randomly — no organisation method**	After a customer completes their purchase, the order is processed in the Amazon Web Services Cloud Computing Network. **Cloud computing** allows us to deliver technology resources – like computing, data storage, networking, and intelligence – through the Internet. We simply call it "the Cloud" for short. After assigning a customer order to a fulfilment centre, we need to determine where the item is stored. Inside the FC, items are stored in tall, moveable shelves called pods. Since items are stored randomly, the item may be stored in more than one pod. A drive unit will eventually deliver one of these pods to a picking station where an associate will pick the item off for packing. An algorithm in **the Cloud** calculates the most efficient combination of picker, pod and drive unit to process each customer order. But how do we keep track of all the robots? The FC floor is a grid system and each square has a unique QR code. As the drive unit moves, the robot uses a camera **sensor** underneath it to constantly scan and update its new location in the Cloud. A sensor is a device that detects and responds to its physical environment. This combination of real-time sensing and cloud processing allows the drive units to work together to clear paths for each other and fulfil orders as efficiently as possible. Watch the included animated video here.
Pack (20-28 min) 	**4) How does a packer choose the most efficient box for packing?** **a.** Years of training with the experts at our Packing Dojo **b. Following on screen commands based on previously recorded item measurements** **c.** Using rulers and tape measures on each item and working out the math for each order **d.** Pick the box which simply looks big enough **5) Amazon's Frustration-Free Packaging Program works with sellers to package their products in packages that are 100% recyclable and ready to ship without additional Amazon boxes. Since 2015 this program has eliminated the equivalent of how many cardboard boxes?** **a.** 100,000 **b.** 2,000,000 **c.** 100,000,000 **d. 2,000,000,000**	Amazon ships a lot of items. We try to be as efficient as possible and use as little time, electricity, cardboard, gasoline, etc. to deliver this item. **Efficiency** is the ability to accomplish something with the least waste of time, energy, effort, or material. Amazon's Sustainability team founded the Climate Pledge and has a goal to be completely carbon neutral by 2040. Many more companies have signed on to join us! How do we practise efficiency when choosing a box to ship an item? We need to pick the smallest box possible while also protecting the items. When an item arrives at Amazon to be sold, we record many facts about it like its height, width, and weight. These facts are stored in a database. A **database** is an organised collection of structured information, or data, typically stored electronically in a computer system. When an item is ordered, the cloud pulls the item's dimensions and weight for the database and automatically calculates (using an algorithm!) which box will be best (even when combined with other items!). Using a database to estimate package size helps us stay more efficient with shipping.

Key Student Outcomes:

Stop:	Interactive Questions:	Computer Science Concepts and FC Context Summary:
SLAM (28-35 min) 	**6) This final station performs one final check to ensure the item is correct, what does it do to make sure the order is correct?** **a. Weighs the item as it goes over the conveyor belt** **b.** Uses and X-Ray to check the item inside is correct **c.** Uses the robotic arm to rattle the box and microphones to listen for the correct sound **d.** It doesn't perform any more checks, you are trying to trick us	The SLAM station addresses the customer order and completes **quality control** — checking to make sure every order is correct. At the SLAM station, the customer address label is applied and a sensor weighs the box. The system references the database to calculate how much the items in the box should weigh and compares that to how much it does weigh. An algorithm decides if the weight is accurate or not. If it is not accurate, the box is pulled off, inspected, and corrected by an associate. If it is correct, it heads onto shipping.
Shipping & Delivery (35-40 min) 	**7) Packages are sorted by hand, with each address label being read by an associate. What does the future of Amazon delivery look like?** **a.** Electric delivery vehicles **b.** Delivery robots **c.** Drone delivery **d. All of the above**	All around the world, humans are constantly constructing new buildings and roads. So, how does Amazon keep its maps updated to deliver to even the newest locations? The answer: machine learning. **Machine learning** is teaching computers to perform or make predictions based on examples or past experience. To keep our maps up to date, we train computers to use satellite images to detect new roads and buildings on their own! Computers can learn? Yes, but it depends on how well they are trained. To train a computer to detect new roads, we show it thousands of examples of satellite images to compare to existing maps. The computer learns what roads and houses usually look like and then creates its own "road detection" algorithm. It uses this algorithm to find and predict roads on new satellite images. Machine learning enables us to process infinitely more data than would ever be possible on our own. Thank you, computer science! Watch the included animated video here.

Stop:	Computer Science Concepts and FC Context Summary:
Career Video (40-45 min) 	Students meet three Amazon Robotics employees. One from Hardware, Software, and Solutions. **Hardware** is the physical parts of a computer or device (stuff you can touch) and **software** is a collection of instructions and data that tell the computer how to work (the code!). Students learn how hardware and software must work together to make the best Amazon Robotics **Solution** possible. Watch the included video here.
Q&A (45-60 min) 	Students are able to submit questions to the tour guides for live Q&A.

Interactive Video Recording:

If you'd like to preview the tour, or if your class schedules don't work with our public tour times, you can use our interactive video recording as a strong substitute for the live experience. Our video recording is hosted on Edpuzzle to allow for student interactivity. We offer two options for our video recording:

Option 1: No login required - Share this link directly to students or use it to project the video on your big screen. After pressing "Join Class", anyone can immediately begin watching. Students can answer trivia questions and leave feedback as they go. We recommend using this option if you are previewing on your own, too. *Note: If you are currently logged into Edpuzzle as teacher, this link won't work. Open in a new browser or in Incognito mode.*

Option 2: Edpuzzle account required - If you have an Edpuzzle Teacher account, you can assign our video to your class to track your students' progress. You are also able to edit the questions to match your students' needs. To do so, access our video here and select either "Assign" or "Duplicate" to begin.

Standards Alignment:

The Amazon Future Engineer Virtual FC Tour is aligned to a variety of educational standards:

- National Curriculum for England
- Northern Ireland Curriculum
- Curriculum for Wales
- Scotland's Curriculum for Excellence

National Curriculum for England (See the curriculum here)

The following statements from the Programmes of Study are fully or partially addressed during the tour:

Key Stage 2

Pupils should be taught to:

- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
- use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- understand computer networks ... can provide multiple services ... and the opportunities they offer for communication and collaboration

Key Stage 3

Pupils should be taught to:

- design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- use logical reasoning to compare the utility of alternative algorithms for the same problem
- understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems
- understand a range of ways to use technology safely, respectfully, responsibly and securely

Key Stage 4

All pupils should be taught to:

- develop their capability, creativity and knowledge in computer science, digital media and information technology
- develop and apply their analytic, problem-solving, design, and computational thinking skills

Key Stage 5

The DfE's guidance on Computer Science content for Post 16 courses specifies that:

- All specifications in computer science must build on the knowledge, understanding and skills established at key stage 4 and encourage students to develop a broad range of the knowledge, understanding and skills of computing, as a basis for progression into further learning and/or employment.

Northern Ireland Curriculum (See the curriculum here)

The following statements from the Programmes of Study are fully or partially addressed during the tour:

Key Stages 1, 2 & 3

Students build towards the following statements based on their age and ability. Pupils can:

Explore

- access, select, interpret and research information from safe and reliable sources;
- investigate, make predictions and solve problems through interaction with digital tools.

Express

- create, develop, present and publish ideas and information responsibly using a range of digital media and manipulate a range of assets to produce multimedia products.

Exchange

- communicate safely and responsibly using a range of contemporary digital methods and tools, exchanging, sharing, collaborating and developing ideas digitally.

Evaluate

- talk about, review and make improvements to work, reflecting on the process and outcome and consider the sources and resources used, including safety, reliability and acceptability

Exhibit

- manage and present their stored work and showcase their learning across the curriculum, using ICT safely and responsibly.

Key Stage 4 - GCSE Digital Technology

Students will cover some of the content for each of the following topics:

Unit 1 Digital Technology

- Software:, database applications, computer hardware, network technologies, network security, cloud technology, moral and ethical considerations, health and safety and using digital applicatons

Unit 4 Digital Development Concepts

- Digital design principles, programming constructs, error handling techniques, test plans and testing

Unit 5 Digital Development Practice

- Designing solutions, building solutions, testing solutions and evaluatiing the solution.

Curriculum for Wales (See the guidance here)

The following statements from the section entitled: **Computation is the foundation for our digital world** within the wider **Science and Technology Area of Learning and Experience** are fully or partially addressed during the tour (although aspects of other parts of the curriculum may also be addressed):

Progression Step 1

- I can identify, follow and begin to create sequences and patterns in everyday activities
- I am beginning to follow a sequence of instructions.
- I can experiment with and identify uses of a range of computing technology in the world around me.

Progression Step 2

- I can use computational thinking techniques, through unplugged or offline activities.
- I can create simple algorithms and am beginning to explain errors.
- I can follow algorithms to determine their purpose and predict outcomes.

Progression Step 3

- I can use conditional statements to add control and decision-making to algorithms.
- I can identify repeating patterns and use loops to make my algorithms more concise.
- I can explain and debug algorithms.
- I can use sensors and actuators in systems that gather and process data about the systems' environment.
- I can explain how digital devices can be interconnected locally and globally.

Progression Step 4

- I can decompose given problems and select appropriate constructs to express solutions in a variety of environments.
- I can explain how systems communicate, in order to design a network.

Progression Step 5

- I can identify, define and decompose problems, choose appropriate constructs and express solutions in a variety of environments.
- I can design and create physical systems that use appropriate components and logic to complete tasks and achieve goals.

Scotland's Curriculum for Excellence and Beyond (See the **guidance here**)

The following statements from the **Technologies** Curriculum Area are fully or partially addressed during the tour:

Curriculum for Excellence

Digital Literacy

- Using digital products and services in a variety of contexts to achieve a purposeful outcome

Technological Developments in Society and Business

- Awareness of technological developments (Past, Present and Future), including how they work.
- Impact, contribution, and relationship of technologies on business, the economy, politics, and the environment.

Computing Science

- Understanding the world through computational thinking
- Understanding and analysing computing technology
- Designing, building and testing computing solutions

National 5 Computer Science Specification

Software design and development

- Development methodologies, Analysis, Design, Implementation, Testing and Evaluation

Computer Systems

- Computer structure

Database design and development

- Design and implementation

Higher Computing Science Specification

Software design and development

- Development methodologies, Analysis, Design, Implementation, Testing and Evaluation

Computer Systems

- Computer structure

Database design and development

- Design and implementation

Advanced Higher Computing Science Specification

Software design and development

- Development methodologies, Analysis, Design, Implementation, Testing and Evaluation

Computer Systems

- Computer structure

Database design and development

- Design and implementation

FAQs:

1. How can I register?

Anyone can register to attend a tour. We offer morning and afternoon tours throughout the week. Pick the one-hour time slot that works best for you or your class. Once you have decided on a tour time, pick the type of tour that best suits your needs:

- **In-class learning:** If students are learning in-person, only teachers need to register. Teachers should project the tour to their class and use a mouse on the large screen to answer interactive questions. You can have students vote on the correct interactive question answer using their hands to signal 1=A, 2=B, 3=C, 4=D.
- **Remote learning:** Teachers can reserve seats for any remote learners during registration. Teachers can request up to 100 remote tickets during registration and will receive an email with unique links for all remote learners to distribute as they best see fit. Each remote learner will need to access the tour from their unique link. Each link works on up to 3 devices at a time. If desired, remote students can register on their own for the tour using the registration link.

2. When will in-person tours resume?

The safety of our employees and guests is our top priority. At this moment there is no set date for when public tours will resume. As the global health situation develops, please check back for more information.

3. What will my class see on the tour?

On the tour, you will see what happens behind the scenes when you shop on Amazon. This includes how our amazing employees support customer fulfilment through the pick, pack, and ship processes.

4. What computer science topics will be covered on the tour?

The following computer science topics will be introduced and explained in real-life context during the tour: algorithm, cloud computing, sensor, efficiency, database, quality control, machine learning, hardware, and software. See the Teacher Toolkit for more information.

5. Can I just register and share the link to my class?

Unfortunately, our current tech platform requires each remote attendee to access the tour through a provided unique link. Teachers should request links for their remote learners during registration. Teachers will receive all links via email upon registration confirmation and can distribute the links to their students however they see best. Each link only works on up to 3 devices, so you cannot share one link to the whole class.

6. How much does this cost?

The tour, and all materials included in the accompanying Teacher Toolkit, are provided to teachers at no cost.

7. What programs do I need to install to access the tour?

You will not need to install any programs to access the tour- the tour will run on your browser. GoToWebinar works on Google Chrome or Mozilla Firefox browsers and on any of the following operating systems (Windows 7 - Windows 10, Mac OS X 10.9 (Mavericks) - macOS Big Sur (11), Linux, Google Chrome OS, Android OS 5 (Lollipop) - Android 10, iOS 10 - iOS 12). See here for **all system requirements**.

8. What year groups can attend?

We recommend the tour for the following age groups:

England and Wales - Year 4 and above

Northern Ireland - Year 5 and above

Scotland - P5 and above

The tour includes content accessible to different ages and abilities, teachers can use the Teacher Toolkit to adjust learning as they see fit.

FAQs:

9. How long is the tour?

One hour total (45 minute live tour + 15 minutes live Q&A).

10. Can individual students sign up by themselves, independent of a class?

Yes, absolutely. Anyone can sign up using the same link as classes if they desire a computer science themed tour.

11. Where can I go for a regular FC tour?

Head to **amazonfctours.com/virtualtours** to join a non-AFE Amazon Virtual FC Tour.

12. Who can I contact for questions?

Please reach out to **afe-uk-contact@amazon.com** for any questions.