University of Sheffield Computer Science

Ambassadors Scheme

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Overview

This 5-term scheme will be designed and delivered by the University of Sheffield Department of Computer Science working in conjunction with Sero Consulting and a range of local employers. It is geared to the interests and learning requirements of Key Stage 4 students, hoping to get at least **5 grades at A*-C including Maths**. This will be a unique opportunity to **girls and boys** who have an interest in computing in guises ranging from computer games and graphics to programming hardware, from large scale everyday uses in mobile apps and social media to highly specialised applications you might never imagine! In terms of **curriculum** benefits, it is designed to

- Deliver the sort of experience of **computer science** advocated by the Minister of State, therefore adding significant value to Level 2 awards offered in schools
- Emphasise the role in **maths** in all forms computing (including computer games), providing practical experiences that will build maths skills
- Develop 21st century **workplace skills**, personal learning and thinking skills with particular emphasis on problem solving and working in teams
- Introduce students to the **world of work** through real employers, workplaces and practitioners in a variety of IT-related specialties; it also links to the City Region's cloud computing and high-tech incubation initiatives.

Running from October 2013 to March 2015, it will provide 70 hours of experience (the equivalent to a standard 10 day Year 10 work placement) as follows

- Term 1: Induction Day
- Terms 1-5: 9 afternoon sessions run by the University department
- Terms 3: Project boot camp over 2 days with industry experts (Friday / Saturday)
- Terms 2-4: 3 full day employer workplace visits

A - Induction Day

The induction day that kicks-off the 5 terms of activity will take place at the University of Sheffield in early October 2013, running from 9.30am to 4.30pm. The programme will include

- 9.30am - Introduction from the Department of Computer Science

- 10.00am - Four hands-on taster sessions to be visited in rotation by all students; lunch will be provided

- 3.45pm - Welcome to the Sheffield Computing Ambassadors Scheme and award of membership certificates

The four taster topics will be as follows:

Taster Topics	Leader	Taster Day – October 2013 – All three schools together (45 students)
A – Microsoft Kinect	Mr Sina Shamshiri	This session will introduce the basics of programming with the Microsoft Kinect sensor. Although primarily an add-on for the XBox console, the Kinect is a sophisticated 3D camera with many applications in computing, including gesture recognition, robot navigation and 3D scanning.
B - Virtual reality and serious games	Dr Daniela Romano	Students will enter into the world of virtual reality and experience the university's interactive snowboarding simulator, which combines 3-D graphics, virtual reality and gaming technology to provide an experience of snowboarding in a fully immersive virtual world.
C - Computers that speak and hear	Prof Roger Moore	This session will introduce real-time signal processing by using the Pure Data 'drag-and-drop' programming language to analyse and synthesise the human voice. Students will experiment with a program to manipulate their own voices and links with contemporary speech technology systems (such as Google's voice search and Apple's Siri) will be discussed.
D – Raspberry Pi programming	Mr James Wallbank - Access Space	This session will offer hands on entry to the world of programming. The Raspberry Pi is a credit-card-sized single-board computer developed in the UK to promote the teaching of basic computer science in schools in a way that encourages programming and innovation.

B - Nine Afternoon Sessions

The sessions will take place once every half term from November 2013 to March 2015. They will all be based at the University of Sheffield, running from 1pm to 4.30pm.

Nine Sessions		2 sessions per term from November 2013 to March 2015 * 3 schools
1 - Introduction to mobile app development	Prof Guy Brown	We will discuss the basic principles of user interface design for mobile apps, with a focus on how to ensure (and assess) the usability of the app. Students will develop a wireframe design for their own mobile app and use the Apple Xcode storyboard tool to make a working prototype.
2 - Programming with objects	Dr Mark Hepple	This session provides an introduction to computer programming, based on the Python language. It teaches the basic concepts, coding constructs and problem solving needed to build useful software and will introduce the key ideas of object-oriented programming, which underpin the organisation of most modern software.
3 - Developing apps for the iPhone	Prof Guy Brown	The Apple iOS devices (iPhone, iPad, iPod Touch) are programmed using Objective-C. This session will introduce the basics of Objective-C programming, taking students step-by-step through writing a simple game for the iPhone.
4 – Handling Data	Dr Mike Stannett	This session provides an introduction to using data in online applications. We discuss the creation of web sites that use PHP to manipulate online data, and consider the legal responsibilities of data users. Key to data protection is the ability to store data securely so we will look at the history of encryption, and briefly discuss the use of mathematics in breaking codes.
5 – Understanding social media	Prof Fabio Ciravenga	This session will explore social media from a computing perspective, and will encourage students to reflect on their role in society. It will examine the possibilities of social media technology using examples from a popular TV

		programme to illustrate the complex issues that arise. We will learn how to retrieve data from Twitter via its application programming interface (API), and see how the markup language XML is used to describe the structure and content of the data that is returned.
TWO DAY BOOT CAMP		**June 2014 - Friday & Saturday** **See description below**
6 - Learning from data	Prof Neil Lawrence	Social networks such as Facebook try to learn who your friends are. They recommend friends, news items and adverts through a technology known as machine learning. Amazon and Netflix use similar technologies to recommend products and films. This session will explore these ideas and how to implement a simple approach to recommender systems known as 'matrix factorization'.
7 - Who goes there?	Dr Richard Clayton	We use passwords and PINs every day on our phones, Facebook pages, and other services, but they don't always provide protection against a determined attacker. We will look at how authentication systems work, how easy it can be to break them and how weaknesses can be overcome.
8 - Computer Games Programming	Dr Steve Maddock	Computer games are a very popular form of entertainment, and they rely heavily on computer graphics. We will look at some of the computer graphics techniques used in games, and create a simple two-dimensional game using Python and an applications programming interface (API) such as Pygame.
9 - Implementing an OCR system	Dr Jon Barker	Optical character recognition (OCR) automatically identifies printed or hand-drawn letters. The session will look at some of the mathematical principles underlying OCR and explore the difficulties that arise in OCR applications like vehicle registration plate readers. Students will have chance to implement a simple OCR system.

C – Two Day Boot Camp (2 days including a Saturday)

Having completed the first five units at the University, students will be ready to have a go at a major project challenge in June 2014. Our customer, the international GOKb consortium, represented by JISC Collections in the UK, wants us to build an suite of applications based on its data about electronic resources that will involve the skills that have been developed in mobile apps, websites and data handling. The 2 days will be supported by a variety of software experts and will introduce new skills in areas such as user requirements capture, project planning, testing and software deployment.

The boot camp will take place at a city centre location and will run from 1pm to 6pm on Friday and 9am to 5pm on Saturday.

D – Visits to IT Employers (3 days)

Sero Consulting will organise for each school group (students plus IT teacher) to make three full day employer visits, which will be local with the exception of the Data Centre. It is proposed that these will be at the end of the Spring 2014, Summer 2014 and Winter 2014 terms. These will be selected from the following options.

Type of Employer	Three whole days
A - A data centre	All schools together
B - A service provider	All schools together
EITHER C - A commercial user	Individual Schools – visit two businesses
OR D – Games / media developers	Individual Schools – visit two businesses